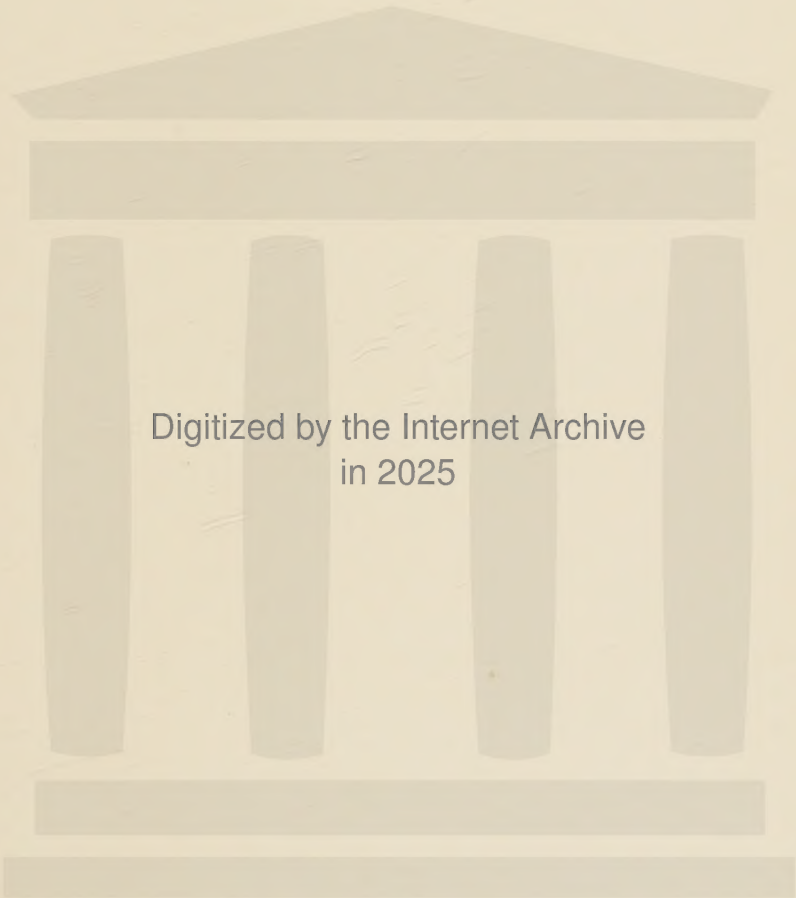
COUNTWAY LIBRARY
HC 4Y3A .

BOSTON
MEDICAL LIBRARY
8 THE FENWAY


Digitized by the Internet Archive
in 2025

https://archive.org/details/practiceofpediat0000char_m0k9

THE PRACTICE OF

PEDIATRICS

BY

CHARLES GILMORE KERLEY

Professor of Diseases of Children in the New York Polyclinic Medical School and Hospital; Attending Physician to the New York Nursery and Child's Hospital; Assistant Attending Physician to the Babies' Hospital; Consulting Physician to the Sevilla Home for Girls and to the New York Home for Destitute and Crippled Children; Consulting Pediatrist to the Greenwich (Conn.) Hospital, to the Tarrytown (N. Y.) Hospital, to the Englewood (N. J.) Hospital, and to the Lawrence (Bronxville) Hospital; Ex-President American Pediatric Society; Ex-President New York County Medical Society

ILLUSTRATED

PHILADELPHIA AND LONDON

W. B. SAUNDERS COMPANY

1914

Copyright, 1914, by W. B. Saunders Company

Published March, 1914 Reprinted July, 1914

BOSTON MEDICAL
MAY 15 1964
LIBRARY

26A207

PRINTED IN AMERICA

PRESS OF
W. B. SAUNDERS COMPANY
PHILADELPHIA

TO

MY PRACTITIONER STUDENTS

PAST AND PRESENT

AT THE

NEW YORK POLYCLINIC MEDICAL SCHOOL AND HOSPITAL,

AT WHOSE SUGGESTION

THIS WORK HAS BEEN PREPARED

PREFACE

THE cordial reception by the medical profession of my previous work on "The Treatment of Diseases of Children" and the request from many sources for a more comprehensive work on diseases of children are responsible for the production of this volume.

The author desires to acknowledge his indebtedness to his associate, Dr. Gaylord W. Graves, to Dr. Alan Brown, to Dr. Ward B. Hoag, and to Dr. H. C. Thompson for their valuable aid in the preparation of the work.

C. G. K.

NEW YORK CITY.

CONTENTS

PAGE

The Newly Born 17

Nutrition and Growth, 17—Maternal Nursing, 21—Human Milk, 31—Wet-nurse, 34—The Breast, 35—The Nursery, 37—The Nursery-maid, 39—Weight, 40—Height, 43—The Care of the Stump of the Umbilical Cord, 43—Mental and Physical Development in the Infant, 43—Baskets for Early Exercises, 45—Crying, 46—Sleep, 47—The Nursing-bottle and Nipple, 47—Substitute Breast-feeding; Artificial Feeding, 48—Cow's Milk, 49—Modified Milk, 57—Cereal Gruels; Starch-feeding, 76—Peptonized Milk, 80—**Disorders of Nutrition,** 81—Marasmus (Arthrepsia; Infantile Atrophy), 81—Habitual Loss of Appetite, 88—Malnutrition in Infants, 90—Tardy Malnutrition and Malnutrition in Older Children, 92—**Feeding after the First Year,** 94—General Properties of Foods, 94—Diet from the First to the Sixth Year, 96—Diet after the Sixth Year, 100—Diet during Illness, 100—Common Errors in Feeding, 102—Milk for Traveling, 103—Food Formulas, 103—The Proprietary Foods, 105—Cream, 107—Sterilization and Pasteurization of Milk, 108—The Effect of Heating Milk upon its Assimilation, 110—Scientific Infant-feeding, 111—Difficult Feeding Cases in Infants, 112—Substitutes for Stomach-feeding, 119—Scurvy (Scorbutus), 124—Rachitis (Rickets), 127—The Delicate Child, 134.

Examination and Diagnosis—Care of Acute Illness 142

Diagnosis, 142—First Examination, 144—**Essentials in the Care of Acute Illness,** 145—The Sick-room, 149—Written Directions, 150—Necessity of Method in the Management of Children, 151—Treatment of the Individual, 152.

Diseases of the New-born 153

Premature and Congenitally Weak Infants, 153—Cephalhematoma, 155—Icterus, 156—Sclerema, 158—Sepsis, 159—Asphyxia, 161—Delayed Asphyxia, 165—Atelectasis, 165—Congenital Absence of Bile-ducts, 166—Umbilical Polyp, 167—Mastitis, 167—Tetanus, 168—Umbilical Granuloma, 169—Hemorrhagic Diseases, 170—The Teeth, 174.

Diseases of the Mouth and Esophagus 176

Sprue (Thrush; Mycotic Stomatitis), 176—Stomatitis, 177—Cancrum Oris (Noma), 180—Fissure of Lips, 181—Geographic Tongue, 181—Ulcerations and Fissures at the Angle of the Mouth, 182—Harelip and Cleft-palate, 182—Malformation of the Esophagus, 183.

Diseases of the Stomach, Intestines, and Peritoneum 184

The Stomach, 184—Acute Gastritis and Acute Gastric Indigestion, 185—Chronic Gastric Indigestion (Chronic Gastritis), 187—Chronic Dilatation of the Stomach, 188—Hemorrhage from the Stomach; Vomiting Blood, 189—Ulceration of Stomach, 190—The Management of Vomiting Babies, 190—Pyloric Stenosis, 191—Acute Gastro-enteric Intoxication, 198—Cholera Infantum, 199—Acute Enteric Intoxication, 205—Acute Intestinal Indigestion, 208—Persistent Intestinal Indigestion, 210—Persistent Intestinal Indigestion in Older Children, 210—Colic, 212—Prevention of the Acute Intestinal Diseases of Summer, 214—Vomiting, 218—Acute Ileocolitis (Dysentery), 219—Chronic Ileocolitis, 226—Mucous Colitis, 228—Hirschsprung's Disease (Idiopathic Dilatation of the Colon), 229—Incontinence of Feces, 230—Intussusception, 231—Constipation, 234—Intestinal Obstruction, 244—Intestinal Cysts or Diverticula (Congenital), 245—The Intestinal Parasites, 246—Appendicitis, 251—Chronic Appendicitis, 254—Acute General Peritonitis, 255—Peritonitis as a Complication, 255.

The Rectum and Anus 257

The Rectum in Children, 257—Prolapse of the Anus and Rectum, 257—Inflammation of the Anus, 259—Fissure of the Anus, 259—Proctitis, 260—Ischiorectal Abscess, 261.

The Spleen and the Liver 262

The Spleen, 262—Splenomegaly, 262—The Liver, 262—Icterus (Obstructive Jaundice; Catarrhal Jaundice), 264.

PAGE

Diseases of the Respiratory Tract 266
The Nose and Throat, 266—Acute Rhinitis (Coryza; Snuffles; Cold in the Head), 266—Chronic Rhinitis (Nasal Catarrh), 268—Nasal Hemorrhage, 270—Throat Examination, 270—Persistent Cough, 271—Faucitis, 273—Pharyngitis, 274—Retropharyngeal Adenitis, 274—Acute Retropharyngeal Abscess, 275—Retropharyngeal Abscess—Tuberculous Caries of the Cervical Vertebræ, 277—Irrigation of the Throat, 277—The Tonsils, 278—Tonsillitis—Acute Follicular Tonsillitis, 279—Peritonsillar Abscess (Quinsy), 282—Acute Catarrhal Laryngitis (Spasmodic Croup), 284—Traumatic Laryngitis, 289—Laryngeal Obstruction, 290—Foreign Bodies in the Larynx, 290—Adenoids, 290—Hypertrophied and Permanently Diseased Tonsils, 294—**The Lungs,** 299—Examination of Lungs, 299—Bronchitis, 306—Recurrent Bronchitis, 311—Acute Spasmodic Bronchitis (Bronchial Asthma), 312—Pneumonia, 317—Lobar Pneumonia, 317—Bronchopneumonia (Catarrhal Pneumonia), 328—Interstitial Pneumonia, Including Bronchiectasis, 338—Hypostatic Pneumonia, 341—Pneumothorax, 342—Emphysema, 343—Primary Pleurisy, 344—Secondary Pleurisy, 345—Empyema (Pleurisy with Purulent Effusion), 347—Pulmonary Gangrene, 356—Pulmonary Abscess, 356—Pulmonary Tuberculosis, 357.

Diseases of the Heart 363
Diagnosis in Diseases of the Heart, 363—Heart Murmurs, 365—Pericarditis, 369—Myocarditis, 372—Congenital Heart Disease, 375—Acute Endocarditis, 378—Chronic Valvular Disease of the Heart, 383—Adherent Pericardium, 387—Abuse of Heart Stimulants, 388.

The Blood and Blood Diseases 389
Blood in the Newly Born, 389—Blood in Infancy or Childhood, 389—The Blood in Different Diseases, 392—Blood-pressure in Children, 396—Coagulation Time, 397—Anemia, 397—Chlorosis, 399—Pseudoleukemic Anemia of von Jaksch, 400—Leukemia, 401—Pernicious Anemia, 402—Purpura, 403—Hodgkin's Disease (Lymphadenoma), 405.

The Glandular System 406
Diseases of the Lymphatic Glands, 406—Acute Adenitis, 406—Persistent Simple Adenitis, 409—Glandular Fever, 410—Tuberculous Adenitis, 410—Mastitis in Young Girls, 413—The Thymus Gland, 413—Status Lymphaticus, 415.

The Urogenital System 417
The Urine, 417—Difficult and Painful Urination, 418—Retention and Suppression of Urine, 418—Incontinence of Urine (Enuresis), 419—Hematuria (Blood in the Urine), 424—Hemoglobinuria, 424—Pyuria, 424—Glycosuria, 425—**The Kidneys,** 426—Tuberculosis of the Kidney, 426—New Growths of the Kidney, 426—Hydronephrosis and Pyonephrosis, 427—Cysts of the Kidney, 428—Acute Parenchymatous Nephritis (Acute Duffuse Nephritis), 429—Chronic Diffuse Nephritis, 437—Chronic Interstitial Nephritis, 440—Pyelocystitis (Pyelitis), 440—**The Bladder,** 443—Cystitis, 443—Vesical Calculus (Stone in the Bladder), 444—Exstrophy of the Bladder, 444—**The Male Genitals,** 445—Balanitis, 445—Phimosis, 446—Paraphimosis, 447—Circumcision, 447—Undescended Testicle, 448—Orchitis, 448—Hydrocele, 449—Gonorrhea in the Male, 450—Epispadias and Hypospadias, 450—**The Female Genitals,** 451—Vulvovaginitis (Simple), 451—Gonorrheal Vulvovaginitis (Specific Vaginitis), 452—Atresia of the Urethra and Vagina, 455.

Nervous Disorders 456
Headache, 456—Pavor Diurnus, 456—Night-terrors (Pavor Nocturnus), 457—Gyrospasm (Spasmus Nutans), 458—Hysteria, 458—Habits, 463—Masturbation, 465—Hiccup, 468—Infantile Convulsions, 468—Laryngismus Stridulus, 472—Tetany, 474—Insanity, 480—Malformations of the Brain and Cord, 482—Type and Incidence of Brain Tumor, 485—Mentally Deficient Children (Imbecility; Idiocy), 485—Mongolian Idiocy, 486—Amaurotic Family Idiocy, 489—Hydrocephalus, 492—Cerebral Palsies—The Prenatal and Birth Forms, 495—The Acquired Form, 498—Chorea (St. Vitus' Dance), 500—Habit Spasm (Tic), 505—The Progressive Muscular Atrophies, 507—Progressive Spinal Muscular Atrophy or Progressive Amyotrophy, 507—The Progressive Amyotrophies (Primary Muscular Dystrophies), 510—Epilepsy, 512—Acute Poliomyelitis (Infantile Paralysis), 516—Multiple Neuritis, 522—Facial Palsy (Obstetric Paralysis), 526—

PAGE

Friedreich's Ataxia (Hereditary Ataxia), 528—Acute Simple Meningitis, 529—Tuberculous Meningitis, 532—Cerebrospinal Meningitis, 536—Lumbar Puncture, 547.

Diseases of the Skin 549

Miliaria (Prickly Heat), 550—Urticaria (Hives; Nettle-rash), 551—Rhus Poisoning (Ivy Poisoning), 552—Scabies (Itch), 553—Furunculosis (Boils), 554—Pediculi (Head Lice), 556—Tinea Circinata (Ring-worm), 556—Tinea Tonsurans (Ring-worm of the Scalp), 557—Impetigo Contagiosa, 559—Pemphigus Neonatorum, 560—Erythema Nodosum, 561—Erythema Multiforme, 562—Erysipelas, 562—Eczema, 565—Eczema Intertrigo or Erythema Intertrigo, 570—Eczema in Older Children, 572—Seborrhea, 575—Bed-sores (Decubitus), 577—Nevus (Birth-mark), 577.

Diseases of the Ear 579

Earache, 579—Deafness, 579—Acute Otitis, 580—Chronic Suppurative Otitis, 585—Mastoiditis, 585—Sinus Thrombosis, 586.

The Transmissible Diseases 587

Care to be Exercised by Physician in Visiting Infectious and Contagious Diseases, 588—Varicella (Chicken-pox), 588—Mumps (Epidemic or Specific Parotitis), 590—Whooping-cough (Pertussis), 593—Measles, 602—German Measles (Röthein; Rubella), 607—Diphtheria, 608—Scarlet Fever (Scarlatina), 623—Typhoid Fever, 637—Malaria, 646—Influenza, 650—Syphilis, 657—Acute Hereditary or Congenital Syphilis, 658—Acquired Syphilis, 664—Tardy Hereditary Syphilis, 665—Tuberculosis, 670—Abdominal Tuberculosis (Tuberculosis of the Mesenteric Gland; Tabes Mesenterica), 673—Chronic Tuberculous Peritonitis, 674—Dactylitis, 678—**The Newer Diagnostic Methods**, 679—Tuberculosis, 679—Tuberculin Skin Reactions, 681—Wassermann Test for Syphilis, 682—Noguchi Butyric-acid Test for Syphilis, 683—Luetin Test, 684—The Widal Reaction for Typhoid Fever, 685—Anaphylaxis, 685.

Unclassified Diseases 687

Rheumatism, 687—Cyclic Vomiting (Recurrent or Periodic Vomiting), 691—Cyclic Diarrhea, 695—Periodic Fever, 696—Rheumatic Fever (Acute Rheumatism), 697—Rheumatoid Arthritis; Arthritis Deformans; Still's Disease, 700—Chondrodystrophia (Achondroplasia), 701—Cretinism (Infantile Myxedema; Cretinoid Idiocy), 704—Dwarfs, 709—Diabetes Insipidus, 710—Diabetes Mellitus, 711.

Miscellaneous Subjects 714

Heredity and Environment, 714—Consanguinity, 715—Temperature in Children, 715—Obscure Elevations of Temperature, 718—Anesthetics, 721—Carcinoma, 722—Obesity, 722—Hematoma of the Sternocleidomastoid, 723—Hernia at the Umbilicus, 723—Hernia of the Umbilical Cord, 724—Congenital Umbilical Hernia, 724—Inguinal Hernia, 725—Ventral Hernia, 727—Diagnosis in Bone and Joint Diseases, 727.

Suggestions in Management 730

Vaccination, 730—Days to go Out-of-Doors; Indoor Airing, 732—Instructions for the Summer, 733—The Exercise Pen, 737—Summer Resorts, 738—Foreign Bodies Swallowed, 739.

Therapeutic Measures 741

Therapeutics in Children, 741—The Therapeutic Value of Climate, 743—Counterirritants, 745—Cold Sponging in Fever, 746—The Cool Pack, 747—Baths, 748—Bathing the Sick, 751—Unpalatable and Nauseating Drugs, 751—Alcohol, 753—Heat as a Therapeutic Agent, 754—Cold as a Therapeutic Agent, 755—Lavage—Stomach-washing, 756—Gavage, 758—Colon Irrigation, 761—Colon Flushing, 763—Vaccine Therapy, 764—Promiscuous Use of Drugs by the Family, 769.

Gymnastic Therapeutics 771

Rules, 771—Posture and Breathing, 774—Breathing, 780—Flat Chest, 783—Kyphosis, 785—Scoliosis, 788—Empyema, 793—Emphysema, 795—Congenital Ataxias, 797—Anterior Poliomyelitis, 809—Constipation, 811—Flat-foot, 812.

Drugs and Drug Dosage 815

Drugs for Internal Use, 815—Drugs for External Use, 827.

INDEX 833

THE PRACTICE OF PEDIATRICS

I. THE NEWLY BORN—NUTRITION—GROWTH

Nutrition and Growth

The fundamental principles in the life of the young of all animals are growth and development. This statement applies to the young of the lower animals as well as to man. Nature has fixed and definite laws in accordance with which this growth and development proceed. The type of animal produced depends in no small degree upon the way in which we comply with nature's laws.

Heredity.—Heredity is, of course, an important factor, but environment counts for more. The young of the lower animals or of man may possess all that can be desired in the way of heredity, but if management during growth is faulty, the adult is almost certain to fall short of the normal. On the other hand, an individual without the benefits of good heredity, when given the advantages of faithful scientific care may develop into an adult decidedly superior in all respects to those more fortunate in birth. I have seen this demonstrated repeatedly, both in the lower animals and in man.

Environment.—From my earliest recollection I have carefully watched the growth and development of animals. By observing care as to feeding, housing, ventilation, cleanliness, and exercise, I have seen animals which promised but little at birth develop into perfect mature specimens of their kind. During the past twenty-five years I have been intimately associated with thousands of infants and growing children in private, in hospital, and in out-patient work. The possibilities of proper growth under good management when little was to be expected, judging from the original condition of the patient, have been impressed upon me repeatedly.

The child is here through no choice of his own. He is to have a future. His health, vigor, powers of resistance, happiness, and usefulness as a citizen are determined in no small degree by the nature of his care during the first fifteen years of life. He has a right to demand that such care be given him as will be conducive at least to a sound, well-developed body, and this should be our first thought and object regarding him. Consider for a moment the number of occupations, other than those of the army and the navy, which require physical fitness before a candidate is accepted. Competition is keen at the present time and will be keener in the future. Employers of men and women, whether in the office, the factory, or on the farm, cannot afford to employ the physically weak.

The most important factor in the making of men and women is nutrition. No great power of reasoning is required to appreciate the fact that the child who is fed on suitable food will become a more vigorous, better developed adult than one who, beginning with his birth and continuing throughout the entire period of his growth, is given only food possessing indifferent qualities for tissue building. Next in importance to food, and following in close succession, are fresh air, cleanliness, cheerful surroundings, and healthful amusements, together with an absence of school work or service of an arduous nature. That the offspring of man suffers more from nutritional errors due to the lack of suitable care than do the young of the lower animals is lamentable, but nevertheless a fact. The absence of thought and care and of knowledge relating to children is due to the fact that the child as such has apparently no intrinsic value in dollars and cents, whereas the young of the lower animals represent no small part of their owner's material possessions.

Feeding.—Success in the entire management of children demands daily attention to detail. Feeding the child properly one or two months out of the year is of little value. He should be fed properly every day in the year, for under normal conditions every day is a day of growth. Another factor having a deterrent influence upon the development of children is their unfavorable start during the first year. Unfortunately many mothers cannot supply to the infant the requisite nourishment. This brings us to the matter of substitute feeding, fraught with perplexities and uncertainties in the most competent hands, and with dangers and disasters in the hands of the incompetent and inefficient. In the chapter on Substitute Feeding in infants their nutrition is considered in detail. It is sufficient to remark here that nature has provided for the baby a food which contains the nutritional elements, fat, sugar, and proteid, in fairly definite proportions and in peculiar forms. Success in substitute feeding depends upon our ability to supply in suitable forms, and the child's ability to assimilate, a food containing the nutritive elements in approximately the quantities found in human milk. An exact reproduction of mother's milk by the use of cow's milk or other food is, of course, impossible. We can imitate human milk, however, with sufficient accuracy to make acceptable and sufficient food for most children who are deprived of the breast. After the nursing or the bottle age, the feeding must not be left to the family judgment, for at this period of rapid growth suitable nutrition is most important. Left to the family, the diet during the second year too frequently consists of milk, which in large cities is often of uncertain nutritive value, together with insufficiently cooked cereals, boxed breakfast foods, bread-stuffs, crackers, and cake—often procured at the grocer's or baker's. At the out-patient departments of the New York Babies' Hospital and the New York Polyclinic Medical School, only 20 per cent. of the children treated who are over one year of age are of normal development. In those under one year of age, only 35 per cent. are normal. While these children are not to be considered as representing the

country as a whole, still they do represent a large part of the population of our larger cities. These children are the offspring of day-laborers, drivers, waiters, and small-wage earners generally. Such children were fed in the manner above described, not because of poverty, but because of an absence of the slightest knowledge on the part of the parents regarding suitability of foods. The children were not hungry; they were fed to satisfy the appetite; but when that was accomplished the parents considered their duty done. To feed with a definite purpose—with a view solely to the physical development of their children—had never entered the minds of the parents, yet most of them could read and write and possessed a fair degree of general intelligence. They were conversant with affairs and had attended the public schools, but were absolutely untaught as to how they should live.

Selection and Preparation of Food.—The diet during this period of early childhood should be highly nutritious, and, in order to be properly digested, food should be given at definite intervals. It should be well cooked and properly seasoned. The habit of allowing children to eat between meals cannot be too strongly condemned. It not only spoils the appetite for suitable food at regular hours, causing children to crave delicacies, but prevents complete digestion and assimilation. The active "runabout" child and the school-child require a high proteid diet. This should consist of red meat, never oftener than once daily, poultry, fish, eggs, milk, butter, cream, whole-wheat bread and cereals, such as oatmeal, cracked wheat, cornmeal, and hominy. For the sake of variety other cereals may be used. Each cereal mentioned should be cooked three hours the day before using. It may be claimed that the prolonged cooking is impossible to secure. It is done, however, in dozens of families under my professional care. Green vegetables and stewed and raw fruits are important adjuncts to the dietary. Dried peas, beans, and lentils in the form of a purée are valuable articles of nutrition because of their large percentage of vegetable proteid, and they are particularly useful in children with a rheumatic tendency, for whom the use of red meat must be curtailed.

Fresh Air.—Doubtless the next most important factor after food and the means of giving it is good air. It is a just criticism of the average American that he is afraid of fresh air, not only by night but by day. Ventilation is one of the most difficult features of a child's management with which I have had to deal. Mothers will feed the children in detail according to instruction. They will bathe them and follow out to my satisfaction every order and direction. The stumbling-block is the open window. If the mother opens it as directed, the grandmother or some other member of the family appears on the scene and closes it. The window-board (p. 150) and other means of ventilation on the market have their uses. The window-board in my hands has been most satisfactory. It is to be hoped that a knowledge of the means and results of treating tuberculosis by open-air methods, and the recent agitation concerning the treatment of pneumonia and other infectious diseases

along similar lines, may so permeate the minds of the masses as to quiet their fears regarding dangers of outdoor air.

In my own experience I have been able to secure an ample supply of fresh air either by the window-board, already referred to, or the open fireplace. While the child is out of the living-room or nursery, the room should be ventilated by opening all the windows, when family conditions allow, the nursery always being aired in this way. The sleeping-room should always be aired for one hour before the child is put to bed. Indoor airing for which the child is dressed as for going out, placed in his carriage or cart, and wheeled up and down the room for an hour or two with the windows wide open regardless of the weather, is most satisfactory in treating very young and delicate children, and promoting convalescence from illness. On inclement days the well child accustomed to his daily outing will be greatly benefited by the indoor airing. It is fully appreciated that such a course of management is impossible in many households. The scheme is the ideal one, however, and should be followed out as closely as possible.

Bathing.—The necessity for the daily bath is appreciated and acted upon by nearly all classes of society. From the time the cord falls and the cicatrix forms, the well infant or child should have one tub-bath daily. If he is too ill for the tub, he is not too ill to be sponged.

Work and Stress.—The well child is naturally good-natured and happy. When such is not the condition, we have not a well child to deal with. Something is wrong. Oftentimes it is the home management. Adults often forget that exuberance of spirits and thoughtlessness belong to childhood. Persistent child-nagging becomes a habit with many parents and teachers; in fact, irritable mothers usually have irritable children. Work involving strain, whether physical or mental, should form no part of the life of the child. In our modern school system the forcing process, the competitions, the giving of rewards of merit, are all pernicious practices. As a result of the competitive system, progress, to be sure, is made along intellectual lines, but at the expense of the physical; and what does intellectual attainment count for in a weakly or diseased body? A child cannot do hard mental work, such as is required of many children from the tenth to the fifteenth year, and be expected at the same time to develop to the best advantage physically. The appetite and digestive powers, the capacity for taking and assimilating food, are diminished. I have seen the result in hundreds of cases. On the streets in New York two pictures always fill me with pity. One is that of the pale, slender school-girl struggling home with a load of books. Such a child who came to me recently had 11 text-book studies besides piano and dancing lessons! When the question is asked the child or the parents as to the necessity for all this work and worry and the close confinement which it entails, the reply almost invariably is that all the girls of her age do the same and she does not want to be behind. The other picture is that of the "little mother"—a pale, wan, tired child from seven to twelve years of age who "minds the baby" and the other younger members of the household

while their mother is away from home or at work. Children so abused are happily growing fewer, owing to various factors which need not be discussed. It is needless to say that neither type of girl makes the ideal woman or mother in any station in life. The condition of boys who work in factories, sweat-shops, or elsewhere is no better. When too much energy is expended in work, it cannot go to the building up of a strong, normal body. The State is the loser and the child is robbed of his birthright.

It is the duty of physicians having children under their care to explain in detail to parents their responsibility as regards the physical welfare of their children. Parents, as a rule, are ignorant concerning a child's management; but they are anxious and willing to do the best things possible, and will carry out suggestions if we take the trouble to enlighten them as to their errors.

Maternal Nursing

Writers on this subject are very prone to state that the ability of the mother, particularly among the well-to-do, to fulfil this most important function is surely decreasing. This may have been a true statement fifteen or twenty years ago; at the present time, however, I am sure it is erroneous. In my own medical life I have seen a change for the better, particularly during the past fifteen years. The young mother of today is better able to nurse her offspring than was her sister fifteen or twenty years ago. I attribute this to the fact that the youth of the present day are more vigorous, more nearly normal individuals than were those of an earlier date. The inability to perform the nursing function so that it will be successful has always been attributed to the mother *ipse.* This, I think, is an error. A child born with a generally enfeebled vitality, keenly feels any slight abnormality in the milk, or may not be able to digest perfectly normal milk; in either event, the milk disagrees and the nursing is discontinued. Not every breast-milk for two or three weeks after parturition is ideal, as I have found by the examinations of hundreds of specimens. Breast-milk during the first two or three weeks of the infant's life is produced under unfavorable conditions which do not indicate the possibilities of the breast as a secreting organ. Early nursing following, as it does, upon the stress of confinement, is not indicative of what may be possible later when the customary life and daily habits are resumed. Repeatedly I have found a very high fat or a high proteid, or both, entirely corrected after the first week or two, without interference. This condition at the time was considered sufficiently serious to warrant the discontinuance of nursing on the part of a weakly infant, while in a vigorous infant it would be entirely ignored.

The change which enables more mothers successfully to nurse their infants is due to two causes—more vigorous fathers and mothers and more vigorous offspring. The more normal the mother, the better able is she to perform this normal function. That this is the case is due, I

believe, to the fact that growing girls and young women are leading more hygienic lives than formerly. The making of golf, bicycle and horseback riding, boating, and automobiling popular and fashionable—in short, the taking of girls out-of-doors and keeping them there a considerable portion of the day—has worked a marvelous change for the better, both physically and mentally. A neurotic mother makes the poorest possible milk-producer. Proportionate to the population, there are fewer neurasthenics among the young women today than there were twenty years ago, and there will be still fewer twenty years hence. At the present time the timid, retiring young woman of the neurasthenic type is not popular in her set. It is fortunate for the future of the human race, at least for that portion which resides in the United States, that the young woman has transferred her allegiance from the crochet and embroidery needle to out-of-door sports. It may be said that our argument holds only with the wealthy or the well-to-do. Imitation is one of the strongest characteristics of the human race, and this tendency in America to outdoor hygienic living pervades all classes. Saturday half-holidays, and the excursions and outings afforded by reduced rates in transportation, are much more popular than they were twenty years ago. Food is better selected and better prepared, owing to increased knowledge on the part of the people as to what constitutes proper nutrition. These are facts, in spite of the sensational novelists and magazine-writers.

A feature which marks an important advance in the right direction is the establishment of a department in dietetics and food economics in the New York Training School for Teachers. The Dean, Dr. James E. Russell, in establishing this course is producing benefits which perhaps are more far-reaching than he realizes. The students are taught food values, food preparation, and food economics, the science of providing for a given amount of money the most nutritious food in its most attractive form. Of the hundreds of teachers sent out from this institution every year to take their places of usefulness as instructors of the young in all portions of the country, each has learned something of food values, and, better still, each has been impressed with the importance, to a growing child, of proper nutrition, without which the best possible type of adult cannot be produced. As a result of such instruction these teachers will be of far greater service in their fields of labor; for not only can they teach what is laid down in the books, but, what is equally if not more important, they are competent to teach those under their care so to live as to attain proper growth, following out the maxim of Herbert Spencer that "the first requisite for success in life is to be a good animal; and to be a nation of good animals is the first condition of national prosperity." It may be thought that we have wandered far from our subject,—maternal nursing,—but such is not the case; for conditions which relate even remotely to this important function demand our respectful consideration. The food and care of the growing girl have the most intimate bearing upon her future life, and if she is to be called upon to perform the most important function of womanhood, she surely

has the right to demand that she receive during her girlhood proper preparation, which heretofore has too often been denied her.

It is not pleasant to criticize physicians, but friendly criticism should always be welcomed. The family physician does not, in a great majority of instances, fulfil his function, or extend his field of usefulness to its full capacity, his conception of duty too often including only the care of the sick. Unsought advice concerning the feeding and daily habits of a child's life, I find is usually welcomed and appreciated by the parents. In practically every instance, according to my observation, errors in a child's management are due to ignorance. Parents, no matter what their station in life, are glad to do what is for the best interests of their children when the situation is made clear to them. It is our duty to take parents into our confidence and explain to them the reasons for the line of action advised. When they appreciate the reason for certain procedures, I find that they are far more apt to follow them. I am confident, from observations upon many cases, that if I could have the physical direction of ten average girls in any station in life, provided that they could have the benefit of fresh air and good food from infancy to adolescence, successful nursing mothers could be made out of eight of them. Certain rules of life having a direct bearing on nursing lead us nearer the ideal and may enable one who otherwise could not nurse her child to do so successfully. These requirements, it will be seen, are laid along common sense lines and cause no hardship or mental distress, one of the chief requirements of a nursing woman being that she shall be mentally normal.

Few functions with which we are called to deal are so variable and uncertain as the production of breast-milk. Breast-milk is one of the most precious substances. It is invaluable—unless we can put a value on human life. The most successful nursing age is between the twentieth and thirty-fifth years. I have, however, seen successful nursing carried on in a girl of fourteen, in a woman of fifty-two, and in the much abused society girl, while I have seen it fail absolutely in peasant women fresh from the fields of Hungary and Bohemia. I have seen those whose nursing at first was most unsatisfactory develop into perfect nurses.

Some mothers will be able to carry on the nursing for only two months; others, three, five, seven, or nine months. In my experience in both out-patient and in private practice it is extremely rare for the breast milk to be sufficient for a child after the ninth month.

The following may be laid down as nursing axioms:

A diet similar to what the mother was accustomed to before the advent of motherhood should be taken.

There should be one bowel evacuation daily.

From three to four hours daily should be spent in the open air in exercise which does not fatigue.

At least eight hours out of every twenty-four should be given to sleep.

There should be absolute regularity in nursing.

There should be no worry and no excitement.

The mother should be temperate in all things.

The Diet.—Many times, when consulted by nursing mothers because the nursing was unsuccessful or a partial failure, I have found that their diet had been restricted to an extreme degree. To put on a greatly restricted diet a robust young mother who has always eaten bountifully of a generous variety of foods is one of the best means of curtailing the quantity and lowering the quality of her milk-supply. When asked to prescribe a diet I tell such mothers to eat as they were accustomed to before the advent of pregnancy and motherhood. That this particular vegetable or that particular fruit should be forbidden on general principles is a fallacy. Food that the patient can digest without inconvenience is a safe food so far as the nursing is concerned, as may readily be determined in any given case. For certain individuals, however, a plain, more or less restricted diet is desirable. This must be remembered in the management of the wet-nurse (p. 34). Many a wet-nurse who has been carefully selected, and who to the best of our judgment should prove satisfactory, utterly fails in a few days to fulfil the duties of the office for which she was chosen. In not a few instances the failure is due to a very full diet of unusual articles of food, the existence of which, in many instances, she never dreamed of. Indigestion and constipation follow, both the nurse and the baby are made ill, and the woman's usefulness ceases. A woman who has lived and kept well on the diet and food found in the home of the laboring man, whether in the city or country, will make a far better wet-nurse on this diet than if she indulges in food to which she is entirely unaccustomed. In general, the diet of a nursing mother, then, should be that to which she has been accustomed.

Nursing is a perfectly normal function, and a woman should be permitted to carry it out along only natural lines. Inasmuch as there are two lives to be provided for instead of one, more food, particularly of a liquid character, may be taken than the mother may have been accustomed to. It is my custom to advise that milk be given freely. A glass of milk may be taken in the middle of the afternoon and eight ounces of milk with eight ounces of oatmeal or cornmeal gruel at bedtime, if it does not disagree with the patient. Our only evidence that a food is not disagreeing is the condition of the digestion. When any article of food disagrees with the mother, or if she is convinced that it disagrees, whether or not such is really the case, the food should be discontinued. In a general way, milk in quantities not over one quart daily, eggs, meat, fish, poultry, cereals, green vegetables, and stewed fruit constitute a basis for selection. The method of preparation for the different meals is not arbitrary.

The Bowel Function.—A very important and often neglected matter in relation to nursing is the condition of the bowels. There must be one free evacuation daily. For the treatment of constipation in nursing women I have used different methods in many cases. The dietetic treatment does not promise much. For here, again, manipulation of the diet

may interfere with the milk production. Three methods are open to use—massage, local measures, and drugs. Massage is available in comparatively few cases. Local measures consist in the use of enemas or suppositories. Every nursing woman under my care is instructed to use an enema at bedtime if no evacuation of the bowels has taken place during the previous twenty-four hours. Many out-patients, in whom constipation is very prevalent, indulge in excessive tea-drinking, often taking from one to two gallons of tea daily. In treating such patients where an absolute discontinuance of the tea-drinking is often impossible and not absolutely necessary, I usually allow two cups a day. For a laxative in such cases and in many others, a capsule of the following composition has served well:

℞ Extracti belladonnæ.....gr. ¼
Extracti nucis vomicæ.....gr. ¼
Extracti cascaræ sagradæ.....gr. v
M. et ft. capsula No. i.
Sig.—To be taken at bedtime.

The amount of the cascara sagrada may be varied as the case may require. In not a few instances I have found it necessary to give two capsules a day in order to produce the desired result. Neither the belladonna, the nux vomica, nor the cascara appears to have any appreciable effect on the child.

Air and Exercise.—Outdoor life and exercise are not only as desirable here as they are under all other conditions, but to the nursing woman, with her added responsibility, they are doubly valuable. In order to get the best results, exercise or work should so be adjusted as not to reach the point of fatigue. The mother whose nights are disturbed should be given the benefit of a midday rest of an hour or two. She should have at least eight hours' sleep out of every twenty-four. Certain annoyances, anxieties, and worries are inseparable from the life of every child-bearing woman. It should be our duty, however, to explain to the mother and to other members of the family that an important element in satisfactory nursing is a tranquil mind. During the lactation period she should be spared all unnecessary care and petty annoyances.

Regularity in Nursing.—The breast which is emptied at definite intervals invariably functionates better than does one which is not, not only as regards the quantity, but also the quality, of the milk; so that system in breast-feeding is almost as essential to milk-production as to its digestion and assimilation.

After it is demonstrated that the nursing is progressing satisfactorily, as proved by the satisfied, thriving child, I begin with one bottle-feeding daily. The advisability of this is obvious: in case of illness of the mother, if she is called away from home, or if, for any reason, the child cannot have the breast, the feeding is provided for. Another advantage of this provision is that it gives the mother needed freedom from restraint. She is thus enabled to have the benefit of a change of scene. Amusements and recreations which the invariable nursing period denies her can be indulged in. As a result of this greater freedom she is able

to supply better milk and to continue nursing longer than if tied continually to the baby, no matter how fond of the infant she may be.

Frequency of Nursing.—The new-born infant is entitled to ten nursings in twenty-four hours. From 6 A. M. to 10 P. M., inclusive, there should be nine nursings. There may be one nursing at 2 or 3 A. M. As the child becomes older less frequent nursings are required. The following table will be found useful in this connection:

Third	to the	twenty-first day	10	nursings
Third	" "	sixth week	9	"
Sixth	" "	twelfth week	7	"
Third	" "	seventh month	6	"
Seventh	" "	twelfth month	5	"

Giving of Water.—From one-half to one ounce of a 1 per cent. solution of milk-sugar should be given the infant every two hours until the milk appears in the breast. Otherwise there will be unnecessary loss in weight and perhaps a high degree of fever due to inanition.

If the child is restless and uncomfortable, it is safe to conclude that he is thirsty; one ounce of the sugar water will usually satisfy him. With the commencement of nursing, the baby should be accustomed to getting his food at regular intervals.

Signs of Successful Nursing.—The normal infant shows a gain of not less than four ounces weekly. This is the minimum weekly gain which may safely be allowed. When a nursing baby remains stationary in weight or makes a gain of but two or three ounces a week, it means that something is wrong, and the defect will usually, but not invariably, be found in the milk-supply. When the baby is nursed at proper intervals and the supply of milk is ample and of good quality, he is satisfied at the completion of the nursing. Under three months of age he falls asleep after ten or twenty minutes at the breast. When the nursing period again approaches, he becomes restless and unhappy, crying lustily if the nursing is delayed. When the breast is offered, he takes it greedily. The stools are yellow and number from two to three daily. The weekly gain in weight under such conditions is usually from six to eight ounces.

Signs of Unsuccessful Nursing.—Theoretically, every normal breast infant should be a thriving, well baby. That such is not the case, is an unfortunate fact. The standard established for a well baby is not upheld. When the supply of milk is scanty the child remains long at the breast and cries when he is removed. He shows signs of hunger before the nursing hour arrives. A cause of failure in breast-feeding, and probably the most frequent cause, is a scanty milk-supply. The chief nutritional elements in mother's milk are fat, 3 to 4 per cent.; sugar, 7 per cent.; proteid, 1.5 per cent. Failure may be due to a marked disproportion of these elements, which may cause sufficient indigestion and resulting loss in weight to necessitate a discontinuance of nursing. Thus there may be a high fat—from 5 to 6 per cent.; or very low fat—from 1 to 1.5 per cent. In the high-fat cases there is usually diarrhea with green, watery stools. The child strains a great deal and there are green stains on many of the napkins. In high-fat cases there

is also regurgitation or vomiting of sour material. The fat-globules may readily be made out if the vomited material is placed under a low-power microscope. Low fat means deficient nourishment and may cause constipation. Sugar is rarely a cause of trouble in nursing babies. It seldom varies, ranging from 5 to 7 per cent. in the great majority of breast-milks. Young children, further, have a marked toleration for sugar. The proteid of mother's milk is the most frequent cause of nursing difficulties. Like the fat, the proteid may be so decreased that nutritional disorder may be induced in the patient, or it may be very much increased, the latter condition being usually the cause of colic or constipation in otherwise healthy nursing infants. In such infants curds may be found in the stools, the passage of which is always accompanied by a great deal of gas. The milk may contain the normal percentage of fat, sugar, and proteid, but be scanty in amount. Instead of the four or five ounces to which the child is entitled, he may get but one or two ounces. Whether or not the quantity is sufficient, may be determined by weighing the baby before and after each nursing for twenty-four hours. One ounce of breast-milk weighs practically one ounce avoirdupois. The quality or strength is determined by an examination of the milk itself (p. 32). The quantity is determined by noting the weight of the child, wearing the same clothing, before and after nursing. By nursing for fifteen minutes, a child under one week old should gain from 1 to 1½ ounces; at three weeks of age, 1½ to 2 ounces; four to eight weeks of age, 2 to 3 ounces; eight to sixteen weeks of age, 3 to 4 ounces; sixteen to twenty-four weeks of age, 4 to 6 ounces; six to nine months of age, 6 to 8 ounces; nine to twelve months of age, 8 to 9 ounces. Of course, arbitrary limits cannot be fixed as to the quantity.

Stationary weight or loss in weight, with a dissatisfied child, usually means defects in quantity of milk, which are readily proved by the weighing. To be fed at the breast may also cause the child to suffer from an excess of good milk, in which event there will be vomiting or regurgitation, usually associated with colic. When this overfeeding continues, dilatation of the stomach develops, vomiting becomes habitual, the child loses in weight, the breast-milk is said not to agree, and often, unfortunately, the baby is weaned. This has been the outcome in scores of cases. When there is habitual vomiting and colic in a nursing baby, two things are to be done—the baby must be weighed before and after nursing, and the milk must be examined.

I have repeatedly treated children for indigestion who were entirely relieved by shortening the nursing period. Weighing the baby at intervals of from three to five minutes and noting the gain has shown that the three or four ounces which may represent the child's stomach capacity were obtained in two, three, or five minutes, the excess which the child took over this amount being the cause of his trouble. From a free, full breast a vigorous nurser will take one ounce in one minute. When the nursing "gait" is established, a child should be kept up to the schedule. There are few more pernicious teachings than that a baby should be allowed to nurse when he wants to and as long as he wants to.

The idea that a nursing infant will take no more than is good for him is the fruit of inexperience. Recently a mother consulted me in regard to giving her one-month-old baby the bottle, as he had many green stools, cried a great part of his waking hours, and weighed but a few ounces more than at birth. Her milk was supposed to be "too strong" for the child. An examination of the breast and a talk with the mother satisfied me that the breast-milk was not at fault. An examination of the milk proved it to be good average milk, containing 3.5 per cent. fat, 6 per cent. sugar, 1.45 per cent. proteid. A one day's test by weighing was instituted. The infant was allowed to nurse one minute and rest one minute. During the resting period he was weighed. In this way, it was found that in three minutes he got from 3 to 3½ ounces of milk. The nursing was then reduced to three minutes on one breast and five minutes on the other, which was the "slower" breast. Thereupon every sign of indigestion promptly disappeared, the stools became normal, and the infant made a satisfactory gain in weight of one ounce daily.

The quantity may be suitable for the age, the child may not vomit or show a sign of indigestion, and yet may not thrive. In such a case an examination or repeated examinations of the milk at intervals of two or three days will usually show that it is poor, below the normal perhaps in both fat and proteid. Such a case occurred in the New York Infant Asylum. A Swedish woman was admitted with an infant two months old in fair condition. She had an abundance of milk and asked for a foster-child, so great was her discomfort from the excessive flow of milk. The weekly weighings of the children soon revealed that there was no growth, and after a few weeks both children upon examination showed developing rickets. The milk was then examined and was found deficient—fat, 1.2 per cent.; sugar, 5 per cent., and proteid, 0.73 per cent.

Signs of Insufficient Nursing.—The baby remains long at the breast, perhaps one-half to three-quarters of an hour. When removed, he is restless and uncomfortable. After a short time, in an hour or less, he is very hungry and demands frequent nursings day and night.

Management of Abnormal Milk Conditions.—When it is found that the breast-milk is too strong or too weak, or when the normal ratios of fat, sugar, and proteid are not maintained, it may be possible to increase or diminish the milk strength. When desirable, it may also be possible to increase either the fat or the proteid. The heavy milk will usually be found in mothers who are robust, who eat heartily, and who take but little exercise. In such a case, the prescribing of a plain diet, allowing red meat but once a day, discontinuing the malt liquors or wine,—which it will often be found that the mother is taking,—and directing that she walk a mile or two a day, will frequently bring the milk to digestible proportions. In some cases, however, this will not be successful, and the colic, constipation, and vomiting may continue, even though the quantity obtained at each nursing is within normal limits. In some instances it will be impossible to change the mode of the

mother's life, except perhaps in the discontinuance of alcohol. When such conditions prevail, the mother's milk may be modified by giving from one-half to one ounce of boiled water or plain barley-water before each nursing. This is a procedure to which I frequently resort. One teaspoonful of lime-water added to one ounce of water before each nursing has made the breast-milk agree when otherwise breast-feeding would have been impossible. When the milk is deficient both in fat and proteid, a diet composed largely of red meat, poultry, fish, rye bread, or whole-wheat bread, oatmeal, cornmeal, with two or three pints of milk daily, will often be followed by an increase both in fat and proteid. The use of alcohol in moderate amounts, in the form of malt liquors or wine, will usually increase the fat. I have frequently seen it advance 2 per cent. in from two to three days. Disappointments in improving the quantity or quality of the breast-milk, however, are frequent.

In addition to the one bottle which, for reasons above mentioned, is given early in the child's life, I find it necessary at the seventh month to add an extra bottle or two. Usually at this time the proteid in human milk begins to diminish in quantity, and as this is the most important nutritional element, an insufficient quantity at this rapidly growing period of life is of no little importance. At the twelfth month, with very few exceptions, my nursing babies are weaned from necessity. At this age exclusive breast-nursing, if one consider the best interests of the child, is practically out of the question. Out of many thousands of cases I recall but one instance where a mother was able successfully to nurse her child after the twelfth month. This remarkable woman, a mother of six children, had nursed every one of them exclusively up to the fifteenth or the eighteenth month.

Mixed Feeding.—With a diminution in the amount of milk secreted, the breast-milk must, of course, be supplemented by modified cow's milk. This method of feeding is usually successful. If the mother of a six-months'-old baby can satisfactorily nurse him three times in twenty-four hours, he may be given, in addition, three bottle-feedings, supplementing the mother's milk. It is best, when using mixed feedings to alternate the breast and the bottle. The modified milk strength should be that which is suitable for the average child of the same age. (See Infant-Feeding, p. 61.) In beginning the use of cow's milk, however, it must be remembered that at first a weaker strength must be used than the child will require for growth, this weaker food being necessary in order gradually to accustom the infant to the change. If too strong a cow's-milk mixture is given at first, it will be very apt to disagree, causing colic and vomiting. Later, when the child has become accustomed to the new food, a stronger mixture may be given. When a mother cannot give her infant at least two satisfactory breast-feedings daily, it is advisable to wean the child.

Maternal Conditions Under Which Nursing is Forbidden.—When the mother has tuberculosis in any of its various forms or manifestations, whether it involves the glands, the joints, or the lungs, breast-feeding is to be forbidden. In epilepsy and syphilis nursing is likewise

forbidden. In nephritis and malignant disease of any nature, and in chorea, nursing should be discontinued. Women who are rapidly losing weight should not be allowed to continue nursing their infants. In case of serious illness of any nature, such as typhoid fever, pneumonia, or diphtheria, and upon the advent of pregnancy, nursing should be terminated.

Care of the Breasts during Weaning.—When the breast-feeding is carried on the usual length of time,—from nine to twelve months,—the process of weaning ordinarily causes little or no discomfort. All that is usually required is to press out enough of the milk to relieve the patient as often as the breast becomes painful, which may not be more than two or three times a day. When the weaning is necessarily abrupt, no little discomfort may result. If there is a free flow of milk, which is apt to be the case when the weaning must take place in the early nursing period, tightly bandaging the breasts is required. When localized hardened areas occur in the glands, they should be massaged until softened, and the bandage reapplied and worn until the secretion ceases. When the weaning can be accomplished more gradually, the infant should have one less nursing every second or third day until only two are given daily. After this has been practised for one week, nursing can be discontinued. In cases where sudden weaning is required, a saline laxative, such as citrate of magnesia or Rochelle salts, should be given every day for five days—sufficient to produce two or three watery evacuations daily. In the mean time the mother should abstain from fluids of all kinds up to the point of positive discomfort.

Conditions Which may Temporarily Produce an Unfavorable Effect upon the Breast-milk, but not Necessitate the Discontinuance of Nursing.—The advent of the first menstruation period particularly, and in some cases the beginning of every menstruation period, is attended with an attack of colic or indigestion in the child. Such attacks, however, rarely necessitate the discontinuance of the nursing even for a single day.

Factors influencing the mental conditions of the mother, such as anger, fright, worry, shock, distress, sorrow, or the witnessing of an accident, may affect the milk secretion sufficiently to cause no little discomfort to the child, and oftentimes the lessening of the flow for a day or two. The influence of the mother's mental state upon the character of the milk was early brought to my attention while I was resident physician at the County Branch of the New York Infant Asylum. In this institution there were usually about two hundred nursing mothers, the majority of them from the lower walks of life, at least 95 per cent. of the infants being illegitimate. The necessity of placing a considerable number of these mothers in wards, in close social contact, gave rise to rather frequent disputes, and not infrequently to fistic encounters of a decidedly vigorous character. After a particularly active disturbance, several nursing infants in the ward would become suddenly ill, usually with vomiting, diarrhea, and fever. We soon learned to know the cause when inquiry or hasty inspection showed that the

mothers of those who were ill had been particularly active in the dispute. A small proportion of the mothers were from the better walks of life. Letters of forgiveness or reproach or visits of a like nature from fathers, mothers, or sisters, have brought many a sick baby to my attention and caused me many anxious moments.

Conditions Which Call for Temporary Discontinuance of Nursing.—During an acute illness with fever, such as indigestion, tonsillitis, and minor illnesses of a like nature, nursing should be discontinued for a day or two. During this period it should be our effort to maintain the flow of the milk. This is best done by emptying the breast with a breast-pump (p. 36) at the usual nursing period until the time arrives when the nursing may be resumed. In such conditions the advantage of having the baby accustomed to one bottle a day will at once be appreciated.

Care of the Nipples.—Six hours after delivery or confinement the nipples should be washed with a saturated solution of boric acid and the child put to the breast and nursing attempted. After this, the attempts at nursing should be repeated every four hours, although the milk does not appear in the breasts until from forty-eight to seventy-two hours after the birth of the child. Colostrum may be present. It is useful as a laxative and may satisfy the child. A further advantage of the nursing at this time is that it gradually accustoms both the infant and the nipple to what will be required later. Immediately after the nursing the nipple should be carefully washed with a saturated solution of boric acid and thoroughly but gently dried. A baby should never be allowed to nurse from a cracked or fissured nipple. For this very painful condition a nipple-shield (Fig. 1) should always be used.

Fig. 1.—Nipple-shield.

HUMAN MILK

While human milk varies as to the proportion of its nutritional elements at different periods of lactation, and even at different times of the day. Milks upon which infants thrive agree within certain limits, so that a standard of limitations may be laid down. Among a great many specimens which I have examined the solids have ranged between 12 and 13 per cent. The range in fat has been from 2.75 to 4.65 per cent., proteid from 0.9 to 1.8 per cent., sugar from 5.50 to 7.3 per cent. These figures represent the analyses of the breast-milks given children who were thriving and who were of different ages. The variations

are not as wide as have been reported by others, but it is to be remembered that all these babies were thriving. Whoever has examined breast-milk even a few times is aware of the existence of the widest possible variations. I have seen breast-milks which contained 8 per cent. of fat and others which contained only 0.5 per cent.; but children thus fed were not well. Fat exists in mother's milk as minute globules in emulsion, varying somewhat in composition, depending upon the kind of food eaten.

The proteids of breast-milk offer a wide field for further study. There are several of these proteids, the most important being casein and lactalbumin. The proportions are subject to considerable variation, depending upon the diet and habits of life of the producer. With a continuation of lactation there is a diminution of the proteid, so that at the ninth or tenth month it is considerably reduced, the total proteid often being not over 1 per cent. The sugar content varies less than does either the fat or proteid, its range of limitation, even in milk otherwise poor, being not over 1.5 or 2 per cent.

Directions for nursing well children will be found on page 26. Whether or not the child is getting a sufficient quantity of milk may be determined by weighing the baby before and after nursing. For this purpose the scales used for weighing children should weigh accurately in one-half ounces. The child, who need not be undressed, should be weighed when put to the breast and weighed at the completion of the nursing. I have repeatedly found that children who should get three ounces or more at a feeding, during the fifteen-minute nursings had increased in weight but one-half or one ounce, showing that only so much milk had been taken. Occasionally cases have been seen where there was no gain whatever after nursing and yet the child was supposed to have been fed. In the event of difficult breast-feeding it is well for the physician personally to supervise a nursing or two, for by this means much valuable information may be gained.

Examination of Human Milk.—Milk of the mother is usually examined to determine whether it contains a sufficient amount of fat, sugar, and proteid to nourish the infant; or to determine whether the quantity of one or more of the nutritional factors is excessive or deficient. Microscopic examination shows us little except the presence of colostrum, which usually disappears about the ninth day and is to be considered abnormal if present after the twelfth day. The presence of blood and pus may also be detected by the microscope. For an accurate analysis the milk should be sent to a laboratory properly equipped for such work. For absolute accuracy it is not safe to judge from the analysis of one specimen of milk; at least two, better three, specimens should be analyzed before coming to a conclusion. In collecting milk for examination the middle of a nursing should be selected.

Laboratory analysis is expensive, however, and beyond the possibilities of many. For out-patient work and those cases in which a determination of approximate percentages is sufficient I have found the Holt milk set of great service. The set consists of a lactometer and two cream-gages. The method of its use is explained by Holt as follows:

"The simplest method is by the cream-gage. Although its results are only approximate, they are in most cases sufficiently accurate for clinical purposes. The tube is filled to the zero mark with freshly drawn milk, which stands at room-temperature for twenty-four hours, when the percentage of cream is read off. The ratio of this to the fat is approximately five to three; thus 5 per cent. cream indicates 3 per cent. fat, etc.

"*Sugar.*—The proportion of sugar is so nearly constant that it may be ignored in clinical examinations.

"*Proteids.*—We have no simple method for determining clinically the amount of proteids. If we regard the sugar and salts as constant, or so nearly so as not to affect the specific gravity, we may form an approximate idea of the proteids from a knowledge of the specific gravity and the percentage of fat. We may thus determine whether they are greatly in excess or very low, which, after all, is the important thing. The specific gravity will then vary directly with the proportion of proteids, and inversely with the proportion of fat—*i. e.*, high proteids, high specific gravity; high fat, low specific gravity. The application of this principle will be seen by reference to the accompanying table.*

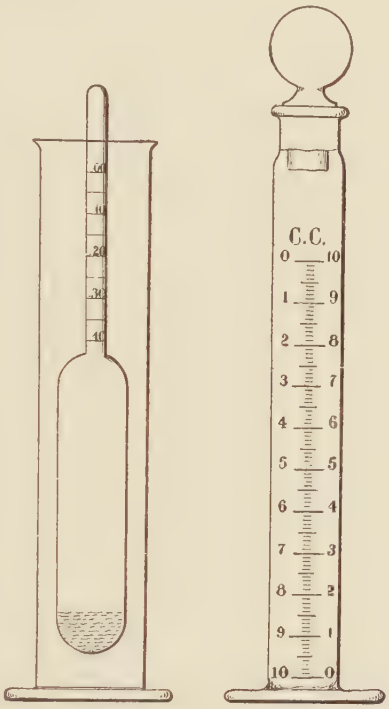


Fig. 2.—The Holt milk set.

"WOMAN'S MILK

	Specific Gravity, 70° F.	Cream—Twenty-four Hours	Proteid (Calculated)
Average	1.031	7 per cent.	1.5 per cent.
Normal variations	1.028–1.029	8 per cent.–12 per cent.	Normal (rich milk).
Normal variations	1.032	5 per cent.–6 per cent.	Normal (fair milk).
Abnormal variations.	Low (below 1.028)	High (above 10 per cent.).	Normal (or slightly below).
Abnormal variations.	Low (below 1.028)	Low (below 5 per cent.).	Very low (very poor milk).
Abnormal variations.	High (above 1.032)	High.	Very high (very rich milk).
Abnormal variations.	High (above 1.032)	Low.	Normal (or nearly so).

* The Holt apparatus may be obtained from Eimer & Amend, Eighteenth Street and Third Avenue, New York.

"Any specimen taken for examination should be either the middle portion of the milk—*i. e.*, after nursing two or three minutes— or, better, the entire quantity from one breast, since the composition of the milk will differ very much according to the time when it is drawn. The first milk is slightly richer in proteids and much poorer in fat."

THE WET-NURSE

We are called upon to select a wet-nurse under various conditions. A few families, particularly those who have had disastrous feeding experiences, ask that no attempts at artificial feeding be made, but that a wet-nurse be engaged in advance of the confinement so as to be ready when the time for her service arrives. Usually, however, our minds and those of the parents turn to the wet-nurse when nutrition by other means is a failure. It is well to remember in this connection that it is not wise to postpone our resort to the wet-nurse until every chance for her being of assistance has passed. It may take a few days' observation or but a single glance at one of these difficult feeding cases to decide whether a wet-nurse must be secured. Certain it is that in a few cases we cannot do without such aid. I see perhaps two or three cases a year, usually in consultation, in which I insist that further attempts at artificial feeding be discontinued because of the reduced condition of the patient.

In the selection of a wet-nurse the age during which nursing is most successfully carried on is to be remembered. As a rule, a wet-nurse should not be under twenty-two or over thirty-five years of age. The peasant women of the continent of Europe make the best wet-nurses. A woman should not be selected as a wet-nurse without a thorough examination both of herself and of her infant. She must be free from skin diseases, tuberculosis, and syphilis. Whether she is stout or thin, tall or short, amounts to little. Neither can we place much reliance on the size of her breasts. Although full, firm breasts and prominent nipples are desirable, the best indication as to her nursing ability is the condition of her baby. For this reason it is best not to select a woman before her baby is four weeks old, for by that time his physical condition will indicate with considerable accuracy the kind of food he has been getting. The wet-nurse's milk need not correspond with the age of the patient for whom she is engaged, as breast-milk from the fourth week to the third month of lactation will answer for any infant.

The results attending the first few days of wet-nursing are often most disappointing. The radical change which takes place in the nurse's habits of life, necessitating the leaving of her own child to the care of others, sometimes produces nervous conditions which may have a decidedly unfavorable influence upon her milk. Before arriving at the conclusion that she will not answer in a given case, she should therefore have time to adjust herself to the changed conditions. Many a good wet-nurse, accustomed to a very plain diet and some work, which necessarily means exercise, has been ruined, so far as her usefulness as

a milk-producer in concerned, by overindulgence at the table. Upon assuming her new office she is temporarily the most important member of the household, next to the baby, and articles of food are supplied to which she is entirely unaccustomed and of which she eats plentifully. The result is an attack of indigestion with fever, the baby is made ill, and the usefulness of the wet-nurse in the family ceases. These women usually do best upon a plain diet of meat, poultry, fish, vegetables, cereals, and milk. If they are accustomed to taking beer, one bottle daily may be permitted. Coffee may be allowed to the extent of one cup daily, and of tea not more than two cups should be allowed. Women of this class are almost invariably neglectful of the bowel function, so that this must be attended to. One free evacuation should take place daily. As a rule, the wet-nurse has been accustomed to work and will be more contented and happy when her time is occupied. If she possess sufficient intelligence to take the baby for outings, she should be allowed to do so. Being out-of-doors from three to four hours a day is of decided advantage to every nursing woman. For the comfort of the family it is wise not to let a wet-nurse know her full value. When she feels that she is indispensable, trouble is apt to follow. It is particularly necessary, therefore, that babies who are wet-nursed should be given one bottle-feeding daily as soon as they are able to take care of it. The wet-nurse will then realize that she can be dispensed with in case of misconduct, or if she leave with an hour's notice the child can be given the bottle until another nurse is secured. In the great majority of my cases it has not been necessary to continue the wet-nursing after the children are seven months of age, for by this time they can usually be fed on the bottle. Of course, unless her nursing proves unsatisfactory, a wet-nurse should not be dismissed at the commencement of or during the summer.

THE BREAST

Cracked and Fissured Nipples.—Fissures of the nipples often result from lack of care and cleanliness. Nipples that are not washed and dried, but allowed to remain moist after nursing, particularly during the first few days, are also very apt to become macerated and cracked. In the cases in which there is a tendency for the breasts to "leak," the milk decomposes on the nipples, and the nipple becomes actually excoriated by the acids formed by the decomposition in the milk. Leaking nipples should be kept covered with pads of sterile absorbent gauze. Cracks and fissures in the nipple may be sufficiently painful to prevent a continuance of the nursing. In getting the histories of not a few bottle babies, I have been told that nursing had been stopped because of cracked nipples. The prevention and successful treatment of the condition, therefore, is a matter of no little importance. A strong child tugging on a fissured nipple may occasion excruciating pain to the mother, and when the fissures are not healed, it can readily be understood that such pain and the dread of nursing may produce sufficient mental distress to change the character or stop the flow of the milk,

either of which conditions may require that the nursing be discontinued.

Treatment.—The treatment which gives the best results, and which is used at the New York Nursery and Children's Hospital, is to bathe the parts with a saturated solution of boric acid after each nursing, dry the nipple, and apply a pad of sterile gauze. Once or twice a day the cracks or fissures are painted with an 8 per cent. solution of silver nitrate. There is no pain attending this application. The pad of sterile gauze just referred to is placed over the nipple and held in position by a binder sufficiently tight to support the breasts. Before the nursing the nipple is bathed with sterile water and the infant takes the breast as usual. If there are deep fissures, it may be well for a day or two to use a nipple-shield (Fig. 1). Another important reason for a rapid healing is the danger of infecting the gland through the open nipple wound—the usual cause of mammary abscess. The use of an ointment on the nipples is not advised, for the reason that it is of little or no service, and in most cases ointments do actual harm because they soften the epithelium and make the nipple tender. Diminishing the

Fig. 3.—English breast-pump.

number of nursings to three daily has been of use in some severe cases which were slow of response to treatment. Removing the child from the breast entirely is to be advised only under conditions of much urgency. The milk may be entirely lost as a result of protracted absence of this stimulation to the breast.

Depressed Nipples.—Not an infrequent source of difficulty in the management of the nursing function in a primipara is depressed nipples. The child cannot get a sufficient hold to make suction possible. He thus fails to get the desired nutriment, and in consequence both the child and the mother become exhausted. When this is repeated a few times, the child is very apt to refuse to make any attempt at nursing. In such cases the use of the nipple-shield is often indispensable, until the nipple is sufficiently drawn out and developed for the child to get hold of. Preceding each nursing it is well to manipulate the nipple for a few minutes or to elongate it by the use of the breast-pump (Fig. 3), without using sufficient force to draw the milk.

Caking of the Breasts.—Caking of the breasts is of very frequent

occurrence during the first few days of nursing. The milk, when it appears in the breasts, is often secreted in large amount. A great deal more is supplied than the child, with his small stomach and usually indifferent nursing, is able to digest. The breasts should be watched very carefully during this time so as to guard against the possibility of the milk remaining undrawn. After the completion of the regular nursing, if a considerable amount of milk remains in the breasts, it should be drawn by the breast-pump (Fig. 3) and the breast thus relieved.

Caking is frequently the outcome of fissured nipples. Sucking on the part of the child, the use of the breast-pump, and hard pressure in milking are all very painful procedures, with the result that the milk remains undrawn.

Treatment.—When nodules form, they may readily be softened by gentle massage. Lanolin should be used on the fingers so as to avoid unnecessary irritation of the skin. The massage should be repeated as often as the nodules appear. The caking is more apt to occur in the dependent portion of the glands. The so-called pendulous breasts, which may show a tendency to cake, should be supported by a binder lightly applied.

Acute and Suppurative Mastitis.—When inflammation of the breast develops with fever, chills, and prostration, it is usually the result of an infection through the nipple, generally one with visible cracks and fissures. For our purposes the different varieties of mastitis need not be considered. Nursing of the involved breast should be discontinued, for the sake of both the child and the mother; in fact, the pain is often so great that nursing is impossible. A supporting bandage should be applied and the milk drawn with the breast-pump at the usual nursing times. It must be our aim to induce resolution without the formation of pus. This is best accomplished by the use of an ice-bag which is applied to the inflamed, indurated area. If there is a tendency to constipation, saline laxatives should be used. In fact, the patient will often be benefited not a little by two or three watery evacuations daily. With a subsidence of the temperature and an abatement of the inflammation, nursing may be resumed. As soon as the presence of pus is determined, it should be removed regardless of its location in the gland. I have seen cases of intestinal infection in the infant and of infectious processes in other parts of the body, that were undoubtedly due to nursing from suppurating breasts.

THE NURSERY

The nursery should be the largest and best ventilated room in the house. In a city home the room may well be located on the third or fourth floor, with a southern exposure. In apartments, quiet and the possibility of free ventilation and sunlight must be considered in selecting the room. For the sake of quiet, the nursery should not communicate with the sleeping-rooms of older children.

In placing children in sleeping-rooms or in a nursery, or in estimating the capacity of hospital wards for children, it is to be remembered that

at least one thousand cubic feet of air-space should be allowed to each child.

The floor of the nursery should not be carpeted. A hard-wood floor is best. If this is not possible, covering the floor with oil-cloth or linoleum is always possible. This can be cleaned with a damp cloth every day. A broom should never be used in a nursery. Paint or hard finish on the walls is preferable to paper. There should be at least two windows and an open fireplace. If possible, the bath-room should be connected with the nursery, to be used not only for bathing the child but as a "changing room." The child's napkins should not be changed in its living-room if it can be avoided. It is needless to say that napkins should never be dried in the nursery.

Steam heat as ordinarily used today is the least desirable means of heating, on account of its uncertainty. In many New York apartments of the better class, the fires are banked at 10 P. M.; the temperature when the child retires is from 70° to 80° F. or more; by five or six o'clock in the morning a fall to 50° or 60° F. has taken place. Such a change in the temperature, with the tendency of children to kick off the bed-clothes, explains many cases of tonsillitis and bronchitis. The temperature of the nursery should be kept as even as possible. When for any reason this cannot be controlled, it is best to have two means of heating, so that when one fails the other may be used. The open grate fire or a small wood-stove is best. Gas should never be employed as a means of heating a child's sleeping-room, on account of the rapid exhaustion of the oxygen which results from its use.

The furniture of the nursery should be of the plainest. Hard-wood chairs and tables with enamel or brass cribs or bedsteads should be used. There should be no article of furniture or furnishings in a nursery, that cannot be washed. In the bath-room or in some room adjoining a pail should be kept containing some disinfectant solution, such as carbolic acid, 1 : 100, or carbonate of soda solution, 1 ounce to 2 gallons of water, in which the napkins are placed as soon as soiled.

There should be two shades at each window, a light and a dark one, so that it will be possible to darken the room during the sleeping time, as well as to exclude the early morning light, which is the usual cause of too early waking. Babies should be taught to sleep until at least 6 o'clock in the morning. This is far better for the child and also for the mother if she occupies the same room. The unnecessary habit of an early waking at 4 or 5 o'clock will in most instances readily be broken by keeping the room dark.

The nursery should have suitable means for ventilation. For this purpose, aside from the fireplace, I have found the window-board of no little service. It can be made of any width. Ordinarily, I have it made about six inches wide. It is sawed so as to fit tightly under the lower sash. This leaves an open space corresponding to the width of the board between the upper and lower sash, and allows the entrance of a current of air which is directed upward. There should be a thermometer in every child's living-room or nursery. It should reg-

ister from 70° to 72° F. by day and from 65° to 68° F. by night. The nursery should be given an hour's airing twice a day. The child should sleep in a crib, alone, not with an adult or an older child. The old-fashioned cradle in which generations have been rocked may be an interesting heirloom, but under no circumstances should it be removed from its place in the garret. It is realized that the above suggestions are not applicable in many homes. Nevertheless, if we aim at the ideal, existing conditions, no matter how unpromising, will invariably be made better.

THE NURSERY MAID

In certain stations and conditions of society the young child is cared for by the mother with the assistance of the immediate members of the family. In thousands of homes, however, a helper is employed to take charge of the child or assist in its care. The selection of a nursery maid is a matter of much importance. Schools for training nursery maids exist in New York city, Boston, Albany, Newark (New Jersey), and doubtless in some other cities. Although such trained help is greatly to be desired, the supply is very limited. Some of my best children's attendants have been women who, although they have not passed the meridian of life, still have reached the seasoned age when the attractive qualities of policemen and grocery boys have faded into a dim recollection. Any industrious, sensible young woman of quiet tastes who is fond of children can be trained in a few weeks into a most useful helper. The association of the nursery maid and child is a close one, and it is the physician's duty to know that the applicant is physically fit for the position.

During a single year the writer has known of three nursery maids who developed pulmonary tuberculosis while in service. Not only should the applicant's lungs be examined, but also the mouth, nose, and throat. Carious teeth and diseased conditions of the throat and nose should receive careful attention before the maid is allowed to assume the position. It is also important that something of the applicant's previous life should be known.

One of the most important things to know about an applicant in a large city, and one most difficult for the physician to discover, is the existence of leukorrhea, or vaginal discharge.* This, however, can usually be discovered by the tactful young mother. Not only should the ideal nursery maid be physically fit, she must be mentally fit as well. For proper mental and physical development, children must be entertained and pleasantly employed. An ill-natured, impatient nurse should be forced to seek other employment. It should not be a task for a child's attendant to play with him. A woman should not be condemned, however, because she fails with any given child. With a child differently situated, with a different temperament, the results may be perfectly satisfactory.

* A very severe gonorrhea was contracted by one of my patients from a nursery maid.

WEIGHT

The average weight of the full-term, newly born infant varies from six to nine pounds. Some are born at term weighing less than six pounds, and a few weighing over nine pounds, but in the great majority the birth-weight will be found between these figures. Holt found from a study of the records of three large maternity institutions in New York city as follows:

The average weight of 568 females was 7.16 pounds.

The average weight of 590 males was 7.55 pounds.

Every family which can afford it should have a scale (p. 42) for weighing the baby, for only by regular weighing during infancy and childhood can we gain an accurate knowledge of growth. During the first five days of life there is usually a loss in weight of four to six ounces. After this initial loss, which may be expected but which does not always occur, a weekly gain in weight is to be looked for, the child regaining the birth-weight on the eighth or tenth day. At first it is advisable to weigh twice a week, or even daily, if the child is not progressing satisfactorily. After the second month, when the infant is making satisfactory progress, a weekly weighing will answer, and this should be continued until the child is one year of age. During the second year, bi-monthly weighings are sufficient. Girls of the same age, after the first year, will average from one-half to one pound lighter than boys. During the third year, monthly weighings will be sufficient to enable one to keep in touch with the child's condition. During the first six months of life a weekly gain of four to eight ounces has been made by the well children under my care. When a child does not make at least an average gain of four ounces weekly, I do not put him in the "doing well" class, but look into his care and nutrition to learn what is wrong. Children vary in growing capacity. Some will increase in weight rapidly, gaining three ounces a day, while others will make a slower gain and yet be perfectly well. Through the care of many children, I have come to regard four ounces as the minimum weekly gain for a well child. In a well infant the birth-weight should be doubled by the fifth or the sixth month, and at one year the weight should be a little over two and one-half times that at birth. During the second year a gain of five and one-half to seven pounds will usually result under proper conditions. During the third year from five to six pounds will be added. At the fifth year the weight should be in the neighborhood of forty-one pounds. It is not to be inferred that these are arbitrary figures or that perfectly well children may not be under or above the figures given at the ages mentioned. These figures are, however, to be regarded as the average for the different ages.

A weight chart with its colored "normal" line will not be found in this book, and physicians are advised against its use. Time and again I have seen well infants, though slow in growth, made ill by overfeeding, in the vain attempts of an ambitious mother or nurse to keep her infant up to the "normal" line. It may be said that the weekly weighing

might have similar effect; not so. Here there is nothing for comparison —no normal red line "staring" the mother in the face.

The weighing alone is not sufficient to inform us absolutely concerning the development of children. I have seen condensed-milk babies who showed a most satisfactory weight curve, yet who, on examination, were by no means up to the requirements for their age as regards their bone and muscle development. A nursing or bottle baby should be examined once a month in order to determine if the progress is along the desired lines as shown by the condition of the teeth, the fontanels, the long bones, and the muscles.

The following table from Holt's "Diseases of Infancy and Childhood" gives the weight and height of children from birth to the sixteenth year. The weights under five years are taken without clothing. After the fifth year the weight of the clothing is to be deducted. The average weight of house-clothing, according to Holt, who quotes Bowditch, is at the fifth year 2.8 pounds for both sexes; at the seventh year, 3.5 pounds for both sexes; at the tenth year, 5.7 pounds for boys and 4.5 pounds for girls; at the thirteenth year, 7.4 pounds for boys and 5.6 pounds for girls; at the sixteenth year, 9.7 pounds for boys and 8.1 for girls. These weights must be deducted from the gross weights in order to obtain the net weights of the children. The season of the year, of course, would make some difference in the weight of the clothing, although this point is not mentioned by the observers.

Age.	Sex.	Weight *Pounds.*	Height. *Inches.*
Birth	Boys	7.55	20.6
	Girls	7.16	20.5
6 months	Boys	16.0	25.4
	Girls	15.5	25.0
12 months	Boys	20.5	29.0
	Girls	19.8	28.7
18 months	Boys	22.8	30.0
	Girls	22.0	29.7
2 years	Boys	26.5	32.5
	Girls	25.5	32.5
3 years	Boys	31.2	35.0
	Girls	30.0	35.0
4 years	Boys	35.0	38.0
	Girls	34.0	38.0
5 years	Boys	41.2	41.7
	Girls	39.8	41.4
6 years	Boys	45.1	44.1
	Girls	43.8	43.6
7 years	Boys	49.5	46.2
	Girls	48.0	45.9
8 years	Boys	54.5	48.2
	Girls	52.9	48.0
9 years	Boys	60.0	50.1
	Girls	57.5	49.6
10 years	Boys	66.6	52.2
	Girls	64.1	51.8
11 years	Boys	72.4	54.0
	Girls	70.3	53.8
12 years	Boys	79.8	55.8
	Girls	81.4	57.1
13 years	Boys	88.3	58.2
	Girls	91.2	58.7

Age.	Sex.	Weight. *Pounds.*	Height. *Inches*
14 years	Boys	99.3	61.0
	Girls	100.3	60.3
15 years	Boys	110.8	63.0
	Girls	108.4	61.4
16 years	Boys	123.7	65.6
	Girls	113.0	61.7

Scales.—A scale for weighing the baby is a very necessary adjunct to the nursery furnishings. There are several varieties of scales on the market known as "baby scales." Their usual construction provides for a basket for holding the baby, the basket being supported by a steel rod which rests upon a spring. A needle indicates on a dial the weight of the child. This variety of scale is very unsatisfactory: it gets out of order easily, it is expensive, and with a vigorous, kicking child, the rapid oscillation of the needle makes an accurate reading of the weight

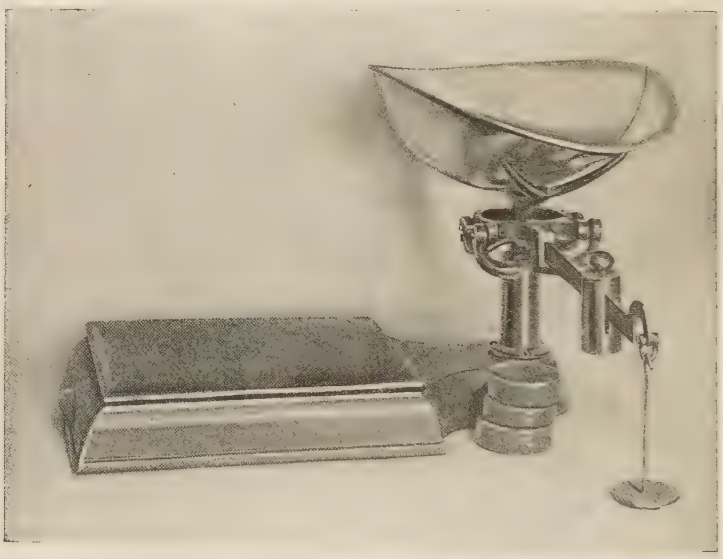


Fig. 4.—Scoop and platform scale.

difficult if not impossible. Further, the weight capacity of these scales is but twenty pounds. When the child's weight reaches this figure, it necessitates the purchase of another scale. The scoop and platform scales used by grocers (Fig. 4) are best. They do not easily get out of order, they weigh correctly from one-half ounce to two hundred and eighty pounds, and being very simple in construction, they can readily be understood. The infant rests on his back in the scoop during the weighing process; older children stand on the platform.

HEIGHT

The length or height of children at the various ages is for convenience included in the weight table. From the standpoint of health or development, height is of no great significance. The length at birth usually varies from 19½ to 21 inches. Children suffering from tardy malnutrition, particularly if syphilitic, may be undersized. Not a few of the non-specific malnutrition and anemic children are tall and thin. It is often a matter of no little distress to parents that their children are undersized. Short mothers and fathers cannot expect very tall children. If the latter have right care, they will probably be larger than the parents, but cannot be expected to grow as much as playmates whose fathers and mothers are tall. The height bears much less relation to the condition of the child than does the weight.

THE CARE OF THE STUMP OF THE UMBILICAL CORD

The space devoted to the care of the umbilical cord might seem out of place in a work of this nature. The excuse is the frequent appearance in private practice and in out-patient clinics of infants with umbilical polypi, granulomata, suppurating umbilical stumps, or eczema involving a considerable area about a moist, actively secreting umbilicus. The management of granuloma, polypus, and localized eczema about the umbilicus has been referred to elsewhere. In order to secure a rapid and complete cicatrization after the cord falls, it is essential that the parts be kept dry. I have used with gratifying success a powder composed as follows:

℞ Pulveris acidi salicylic.....gr. x
Pulveris acidi borici.....gr. xxv
Pulveris amyli
Pulveris zinci oxidi.....āā ℥ss

Over this powder, which is used freely in the open wound, is placed a retaining pad of gauze. The dressing should be changed and fresh powder applied every time the child is fed. For the small unhealthy granulations often present, cauterizing with a 50 per cent. nitrate of silver solution may be necessary once or twice, after which the powder should be used until the secretion has entirely ceased and cicatrization is complete.

MENTAL AND PHYSICAL DEVELOPMENT IN THE INFANT

Dr. Frederick Peterson,* of New York, has made an exhaustive study of the mental development of the newly born.

In all, 1060 newly born infants were examined, the observations extending for one year. His observations, which are to be looked upon as authentic, are as follows:

"1. **Sight.**—Sensibility to light is present in most infants at birth, and this is the case even in those prematurely born. The optic nerve

* Bulletin, Lying-in Hospital, December, 1910.

is, therefore, already prepared to receive impressions, sometimes even before the time of normal birth.

"2. **Hearing.**—Sensibility to sound is quite as apparent as sensibility to light at birth, for 276 normal white children reacted to sound on the first day of life, and 146 reacted to light. A similar condition existed among the premature infants, many reacting to sound on the first day as well as to light. The auditory nerve is already prepared to receive impressions of sound sometimes before the period of normal birth. This is wholly contrary to the opinions of other authorities.

"3. **Taste.**—The gustatory nerve not only reacts differently to salt, sweet, bitter, and sour at birth, but the same mimetic reactions are observed in premature infants. This nerve is, therefore, ready to receive taste impressions some time before the normal period of birth.

"4. **Smell.**—Two hundred and seven normal white children reacted to odors on the first day of birth, and similar reactions were observed in premature infants. The olfactory nerve is ready to receive smell impressions some time before the end of the normal period of gestation.

"5. **Cutaneous Sensibility.**—Reactions to touch and temperature and affective manifestations of discomfort, obtained the first day in large numbers of normal infants, were similarly obtained in premature infants, showing that such sensibility is already present before the expiration of the period of normal gestation. There is every reason to believe that sensitiveness to painful stimuli is present, but the reactions are more vague and uncertain than in later life, which leads many to assume that the sense of pain is dull in the new-born. Muscular sense cannot be tested in infants, but there is every reason to believe that muscular sense, the sense of motion, and sense of position are developed early *in utero*.

"6. **Thirst-hunger and Organic Sensation.**—The new-born child frequently reacts to thirst-hunger on the first day, though the actual need of food is seldom apparent until after the first or second day. Discomfort is clearly marked when nourishment is not forthcoming. The cries of discomfort and pain are marked in the first day in full-term infants and noteworthy in the premature.

"7. **The Beginning of Memory, Feeling and Consciousness in the New-born Child.**—There are good grounds for believing that the new-born child comes to the world already with a small store of experiences and associated feelings and shadowy consciousness. The fact that even in premature infants we find the senses already prepared for the reception of impressions on the five senses is some evidence of such impressions having been already received and stored up in the dim storehouse of a memory already begun. It may even be that some sort of vague light impressions have been received, for it is possible that in the interior of the body the alternation of day and night may in a mild degree be manifested. The transillumination of the hands before a candle, of the skull and face bones by examination of the frontal sinuses and antrum with electric lights, are evidences of a certain amount of translucency of the whole organism to sunlight, which is so much more powerful than any artificial light. There is greater possibility in the matter of

the auditory sense, that it may be stimulated by sounds within the body of the mother (by bone conduction possibly)—such sounds as the beats of the maternal and fetal hearts, the uterine and funic souffles, and the bruit of the maternal aorta.

"Moderate stimulation of the gustatory nerve is thought to occur through the common swallowing of amniotic fluid by the fetus.

"A marked development of receptivity in the senses of touch and of muscular sense during uterine life is undisputed. Movements begin considerably before the sixteenth week of pregnancy, and increase in character and extent from that time on. Often they are so violent as to be painful to the mother. The activity of the muscles and constant contact of various parts of the fetal body with the uterine walls for a period of months before birth must lay a foundation under the threshold of consciousness for a sense of equilibrium and vague spatial relations. The material basis of consciousness is prepared long before birth.

"There is already a feeling tone associated with the earliest reactions, though we are altogether in the dark as regards its psychophysiology. The process has been thus formulated: Stimulus—reaction—liking—reinforcement. Stimulus—reaction—dislike or pain—inhibition. This is the early simple associative memory in reactions to stimuli.

"8. There are no perceptible differences in reactions of colored and white children or between pairs of twins.

"Ability to hold the head erect: This may be acquired at the third month. Few infants, however, are able fully to support the head before the fifth month. Not a few perfectly normal infants will not be able to support the head before the ninth month.

"Sitting erect: The ability to sit erect unsupported is acquired between the sixth and eighth months.

"Standing: Many infants will stand with simply hand support at the tenth month. Exceptionally well-developed infants will stand with the hands resting on some object at the eighth month. A remarkable infant under my observation could stand at the fifth month, and walked alone at the eighth month. The average infant walks alone from the fourteenth to the sixteenth month. A few will be able to walk unsupported before this period, and other normal children will not walk alone before the eighteenth or twentieth month.

"Laughing: Many infants may be made to laugh from the third to the sixth week.

"Memory: The infant's memory is very short. I have repeatedly known infants eighteen months of age who have entirely forgotten the mother in a week.

"Speech: Intelligible words are formed at about the twelfth month. From the eighteenth month to the second year two or three words will be intelligently put together."

BASKETS FOR EARLY EXERCISES

It is a mistake made in many families to have the baby in the arms a greater part of his waking hours. This practice should be discouraged

by physicians, for when the child is held, there is always a tendency to make him sit upright on the arms or knee without proper support. During the early months of life the vertebræ and vertebral ligaments are not sufficiently developed to support the heavy head and trunk. If this thoughtlessness on the part of parents with its attendant dangers were explained, there would be fewer cases of displaced scapulæ and spinal curvature to be treated later. Many cases of spinal curvature are the direct outcome of such early abuse of the spinal column. Still, it is not desirable that the child should constantly occupy the crib. A large clothes-basket in which a thick blanket and pillow have been placed affords a safe playground for a small baby. For the first few months he will lie on his back and amuse himself in his own peculiar way. After the sixth month, when he may be allowed to sit up for a short time each day, a pillow should be placed behind his back for support. The basket supplies plenty of room for toys and other means of entertainment. When the child begins to stand and attempts to walk, the basket period is at an end and the exercise pen (p. 737) should be brought into use.

CRYING

It is well for the young infant to cry a little every day. Muscular movements involving a greater part of the body accompany the act of crying and furnish exercise. Peristalsis is increased, as is often evidenced by a movement of the bowels occurring during crying, particularly when there is diarrhea. In crying, deep breathing is necessary, the lungs are expanded, and the blood oxygenated. The well baby cries when frightened, or uncomfortable from hunger, soiled napkins, or inflamed buttocks. He cries from pain, from heat, from cold, from unsuitable clothing, and during difficult evacuation of the bowels. He also cries when displeased or angry. Authors are prone to refer to the diagnostic value of an infant's cry. It is my belief that characteristic cries are not to be depended upon sufficiently to give them a differential diagnostic dignity. Children slightly but painfully ill may cry incessantly for an hour or two. Thus, with intestinal colic, the cry is loud and continuous until the child is relieved or falls asleep from exhaustion. Earache is not an infrequent cause. The habitual criers, the restless and vigorous, crying, whining infants, are uncomfortable. With very few exceptions the trouble will be found in the intestinal tract. The well-trained, normal child, whose nourishment is suitable, is seldom troublesome. When well, all babies are naturally good-natured and happy in their own way. Badly managed, spoiled infants often cry vigorously when left alone. When attention is given them, when they are taken up and talked to, the crying ceases. This readily tells us that pain or discomfort was not an element in causing the cry. By these infants, discipline, not medication, is needed. The management of the habitual crier involves the relief of the condition which causes the discomfort, or the most rigid discipline, when it is demonstrated that we are dealing with a "spoiled infant."

SLEEP

The infant who sleeps well is almost always a normal, well-fed baby. Irritability and sleeplessness are associated with indigestion more frequently than with any other disorder. During the first few days of life the sleep, in normal conditions, is almost unbroken, except when the infant is fed. During the first month the infant sleeps about twenty-two hours out of every twenty-four; during the second and third months, from twenty to twenty-two hours. At the sixth month the child should sleep from 6 P. M. to 6 A. M. without interruption except for feeding or nursing, which need cause very little disturbance. At this age there should be a two-hour nap during the morning and a two-hour nap in the afternoon, although it is not well to have the baby sleep after three o'clock in the afternoon. The twelve-hour night rest should be continued until the child is six years of age. The day naps will gradually be shortened by the child. At one year of age, one hour in the morning and two hours in the afternoon suffice. From the eighteenth month to the second year the morning nap is given up. Afternoon rest for at least one and one-half hours should be continued until the sixth year of age, and longer if the child is inclined to be delicate. Regular sleep is largely a matter of habit, and if the infant is started right with suitable feedings given at definite times, followed by the proper period of sleep, but little trouble will be experienced. When sleep is disturbed and broken, it means bad habits, unsuitable food, minor forms of indigestion, or positive illness of some kind. Sleep is important for purposes of growth, not only in early infancy but throughout childhood. Not a few infants form habits of sleeping in the daytime and being wakeful at night. This is best remedied by keeping the baby awake during the day, by entertainment, and by keeping him in a well-lighted room. A proper amount of sleep is most essential to nutrition, and I am sure that the satisfactory results which I have had the good fortune to achieve in the treatment of secondary malnutrition and anemia have been due in part to my insistence that the child sleep in a quiet, darkened room for two hours after the noon-day meal. The energy expended in twelve hours by an active child is incalculable, and when a portion of this energy is reserved and the body fortified by rest and sleep during the middle of the day, there is a greatly diminished daily expenditure of strength units.

For bathing newly born see p. 20.

THE NURSING-BOTTLE AND NIPPLE

There are two requirements that a nursing-bottle must fulfil: It must have a capacity sufficient for one full feeding and it must be so constructed as to be readily cleansed. The oval bottle (Fig. 5) with rounded edges answers best. These may be obtained in sizes of from three to nine ounces. As many bottles are needed as there are feedings in twenty-four hours. The bottle should be boiled once a day, scrubbed with a stiff brush with hot borax water, and remain in

the borax water until needed. Two teaspoonfuls of borax to a pint of water is the strength usually used. Before using, bottles should be rinsed in plain boiled water. The straight black nipple (Fig. 5) is also preferred, for the reason that it can be turned inside out and easily cleansed. A nipple which cannot be turned should never be used. After use, the nipple should be turned and scrubbed with a stiff brush and borax water—a tablespoonful of borax to a pint of water. When not in use, the nipple should be kept in borax water. Before being placed on the bottle, it should be rinsed in boiled water. The nipple should be boiled once a day. The blind nipples—those without holes—are the best. Holes of the required size may be made with a red-hot cambric needle.

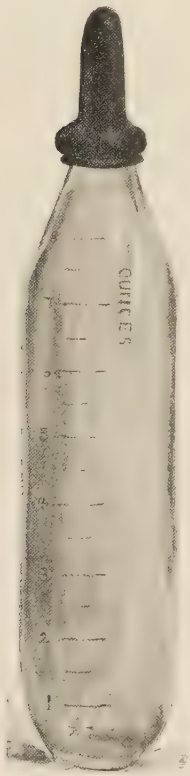


Fig. 5.—Nurse-bottle and nipple.

Substitute Breast-feeding; Artificial Feeding

A considerable number of the young of the human race are deprived of the natural means of nutrition, the milk of the mother. For comparatively few is a wet-nurse available. While in proportion to the children born more mothers are nursing their infants now than formerly, nevertheless every year thousands of infants are brought into the world who have to be nourished by other means than human milk. The fact that an immense number of deaths occur every year among these infants because of defective nutrition speaks for itself.

Nutritional Errors.—Mortality statistics give a very inadequate idea as to the part played by nutritional errors in the young, for the reason that in many instances such errors are not the direct or perhaps the immediate cause of death, and for this reason their influence does not appear in mortality statistics. As elsewhere pointed out, and dwelt upon at length in this work, in disease of any nature a child's resistance is a factor of paramount importance. With defective nutrition, resistance is invariably below the normal. Many of the infants who die from the intestinal diseases of summer, from grip, from tuberculosis, or from infectious diseases, suffer from defective nutrition in different degrees of severity before the immediate cause of death exists.

The Needs of the Patient Paramount.—As nutrition deals directly with questions of life and death, it is not surprising that volumes have been written on the subject, but it is surprising that the fundamental principles of infants' nutrition are so little understood. This is due in part to the fact that writers and teachers of infant-feeding, in their efforts to be scientific or ultra-scientific, have lost sight of the point

that there is a patient as well as a pupil to be considered, and that not a few teachers with their algebraic or otherwise intricate formulas do little but obstruct the progress of rational feeding by making a readily comprehended subject impossible to many. Another common error is in not distinguishing between children—the rich and the poor, the sick and the well. A child with malnutrition, with marasmus, or with a temporarily disordered digestion is by no means a well baby, and when he is given food suitable only for the well, his condition very naturally is not improved.

Environment.—In feeding an infant, several predominant factors must be considered: First, the influences of environment. The infant in a children's institution has to be fed differently from one who comes to a dispensary for treatment, and both must be fed differently in summer than in winter. The child of well-to-do, intelligent parents is fed still differently. There are no hard and fast lines in infant-feeding other than that there must be an ample supply of such nourishment as the child can digest and thrive upon. Cow's milk is used as the basis of infant's food, for the reason that it is ordinarily readily adapted to the child's digestion and is the most available substitute for human milk.

Successful Substitute Feeding.—Successful substitute feeding of infants consists, then, in giving something upon which the child can live and thrive, and when, in addition, this "something" supplies the nutrition which nature demands, it constitutes scientific infant-feeding, whatever the source of the nutriment. Cow's milk is just as fully an unnatural food for an infant as is barley or rice gruel or the milk of the goat or the ass; and cow's milk only is used, as already mentioned, because in a great majority of cases it answers the given purpose better than does any other food, in that it furnishes in available form the nearest approach to the nutritional elements required. From an analysis of many human milks we know what should constitute a child's food. Cow's milk, however, differs from human milk in important features.

COW'S MILK

As cow's milk furnishes the most available basis of nutrition for the infant who is deprived of the mother's milk, it is essential in order to secure the best results from its use as an infant food, that it contain total solids between 12 and 13 per cent. and that the solids be represented in the nutritional elements in somewhat the following proportions:

Fat	3.5	to 4	per cent.
Sugar	4	to 4.5	"
Total proteid	3.5	to 4	"
Ash	0.7	to 0.9	"
Specific gravity	1.028	to 1.033	

In order that the milk may be of a fairly constant strength, herd-milk is to be preferred to the product of one or two cows, as the quality of the latter may vary considerably from day to day. It has been demonstrated that the best cows for this purpose are what are known

as "grade cows," that is, not pure bred. Such cows thrive better, are more easily kept healthy, and are more uniform in the nutritional equivalent of their milk-supply than are high-class registered herds of the Alderney or Jersey strain.

The fat of cow's milk is in the form of a fine emulsion and separates as cream. Its character is affected by the cow's food, being softened when some articles are fed and hardened when other kinds of food are used.

There are several proteids of cow's milk, of which the most important and best known are casein, which forms the curd, and lactalbumin, the proportion being about three parts casein to one part of lactalbumin. In mixed milk from several cows this proportion is by no means constant. The sugar of cow's milk is lactose, which is less sweet to the taste than cane-sugar or granulated sugar or maltose derived from starch. That cow's milk shall contain a certain quantity of total solids, and that it shall be of a specific gravity within certain limits, is necessary in order that it may supply nourishment to the child. Another most important feature to be taken into consideration is cleanliness, which naturally brings us to a consideration of the bacteriology of milk—a large subject which can be but briefly referred to here. Milk fresh from the udder contains very few bacteria, particularly if the first two or three jets from each teat are discarded. The time for bacterial contamination is during the milking and while the milk remains in the stable. Certain forms of bacteria are harmless, and it is impossible to have a milk absolutely free from bacteria. What we need to know is how dangerous bacteria get into the milk, and how they cause changes that may convert it into a poison of greater or less virulence.

Harmless Bacteria.—The souring of milk is the result of the presence of bacteria which produce changes in the sugar-of-milk, with the formation of lactic acid. The "turning" of milk during a thunder-shower is due to certain changes in the atmosphere that aid in the development of the bacteria which convert lactose into lactic acid.

Harmful Bacteria.—Bacteria of decomposition, under conditions favorable to their growth, attack the proteid constituents of the milk, producing putrefactive changes with evolution of poisons which may be of the greatest virulence. The putrefactive bacteria are always present in stables where manure is allowed to collect and where cleanliness is not observed. When we remember what a culture-field milk affords to bacteria, and when we see the manure and the surroundings in which milk is usually drawn, it is not surprising that the milk should contain many millions of bacteria to a cubic centimeter. They may enter the milk from the dust in the stable,—a very fruitful source,—or they may find entrance from the milker's hands or from droppings of fine particles of manure from the belly of the cow. Bacteria from these sources are among the most dangerous forms found in milk. When bacteria once gain entrance into the milk, their growth is most rapid. In corroboration of this, the obervations of Parsons* are most interesting and instructive. He writes as follows:

* Cornell Reading Course, December, 1905.

BOSTON MEDICAL
MAY 15 1964

"There is more or less dust floating in the air of houses and stables, and this dust is constantly settling. When it falls into the milk, it carries bacteria with it. If the milk is warm, these bacteria multiply very rapidly; if the milk is cold, they may develop slowly, but they will be ready for rapid growth as soon as the temperature is raised. The production and care of good milk depend very much on the care taken to prevent dust from getting into it, and the maintaining of a low temperature after it is drawn.

"Last summer, Walter E. King, of the State Veterinary College, and myself (Parsons), made a number of tests to determine the importance of different sources of milk contamination. In most of these tests a definite quantity of sterilized milk at 98° F. was exposed to some one kind of contamination that we wished to test. The milk was then examined, and in that way we could obtain a fairly accurate idea of the extent of this particular kind of contamination. Some of the experiments and their results are as follows:

"1. *Exposure to Air in the Stable.*—Two liters (about two quarts) of sterilized milk were placed in a sterile pail and exposed seven minutes to the stable air in a passageway behind the cows. This stable was doubtless cleaner than the average, and the air contained less dust than is often found in places where milk is being handled. Immediately after the exposure the milk was 'planted' and we found it to contain 2800 bacteria per cubic centimeter (about 15 drops); in other words, between 5,000,000 and 6,000,000 bacteria had fallen into the two liters of milk in this short time.

"2. *Pouring of Milk.*—When milk is poured from one vessel into another, a very large surface is exposed to the air, and great numbers of bacteria are swallowed up. The following tests illustrate this point: About five liters of milk were poured from one can to another eight times in the stable air. It was found, after pouring, that this milk contained practically 100 bacteria per cubic centimeter more than it contained before pouring; in other words, about 600,000 bacteria had gotten into the milk on account of this exposure.

"In another similar experiment, when there was a little more dust in the air, the contamination due to pouring eight times was two and one-half times greater than in the preceding experiment.

"3. *Contaminated Utensils.*—Much contamination of milk results from putting it into dishes that have been cleaned and then exposed where dust can fall into them. In experiments to determine what this kind of contamination amounts to it has been found that when little care is taken to protect the dishes, the milk will often contain several hundred times as many bacteria as when the utensils were protected from dust. In order to illustrate this point, two pails were carefully washed and sterilized. One of them was covered with sterile cloth to keep dust from falling into it. The other was left exposed for only a few minutes to the air of a clean creamery. A small quantity of sterile milk was then put into each pail, rinsed around, and then examined for bacteria. It was found that the milk in the pail which was not

protected from dust contained 1600 more bacteria per cubic centimeter than the milk in the protected pail.

"4. *Contamination from the Cow's Udder and Body.*—Great numbers of bacteria fall into the milk when it is being drawn, because the milking-pail is directly under the udder, which is being shaken more or less by the milker. This kind of contamination may be reduced by cleaning the udder. For example, it was found that sterile milk, exposed under the udder as long as it takes to milk a cow, while the udder was being shaken about the same as when milk is being drawn, contained 19,000 bacteria per cubic centimeter. In this case the udder had been wiped off with a dry cloth in much the same way as is done in fairly good dairies.

"In a similar test the udder was wiped with a damp cloth, when the number of bacteria was reduced to 4500 per cubic centimeter. In a

Fig. 6.—New.

Fig. 7.—Old.

Figs. 6 and 7.—Milk-pails.

third experiment the udder was wiped with a cloth dampened in a 4 per cent. carbolic acid solution, when the number of bacteria was found to be 3200 per cubic centimeter. In cases where no particular care is taken to clean the udder, the bacteria getting into the milk from this source may run up into the millions.

"5. *Importance of Small Openings in Milk-pails.*—(See Fig. 6.)—From the experiments above mentioned, it will be seen that it is impracticable to clean the udder or free the air from dust so perfectly that no bacteria will fall into the milk. The next question is, How can we reduce the number of those that will fall in, despite all reasonable precautions? The easiest way known is to use a small-top milking-pail, thus reducing the size of the opening through which dirt can fall in. An experiment to illustrate this point showed that milk drawn into an

ordinary milking-pail (Fig. 7) contained 1300 bacteria per cubic centimeter; while that drawn into a pail with an opening about one-half as wide, contained only 320 bacteria per cubic centimeter. This is exactly proportionate to the number of square inches of exposed surface in the two pails. For example, a pail having a circular top fourteen inches in diameter has an opening of 153.86 square inches; a pail with a 12-inch top has an opening of 113.04 square inches; one with a 10-inch top has an opening of 79.79 square inches; and a pail with an opening 6 inches in diameter has an exposure of 28.26 square inches. (See Fig. 6.)

"Milkers should get into the habit of using the small-top pail, as it is one of the easiest of all ways of reducing the number of bacteria that fall into the milk.

"6. *Contamination by Flies.*—A fly or a bit of hay or straw or a piece of sawdust or a small hair may carry enormous numbers of bacteria into milk, as is shown by the following experiments:

"A living fly was introduced into 500 c.c. of sterile milk. The milk was shaken one minute, when it was found to contain 42 bacteria per cubic centimeter. After twenty-four hours at room-temperature it contained 765,000 bacteria per cubic centimeter, and after twenty-six hours, 5,675,000.

"7. *Dirt in the Milk.*—A piece of hay about two inches long was placed in 500 c.c. of sterile milk. The milk was shaken one minute, when it contained 3025 bacteria per cubic centimeter. After twenty-four hours at room-temperature, it contained 3,412,500 bacteria per cubic centimeter.

"One piece of sawdust from the stable floor was put into 500 c.c. of sterile milk. The milk was shaken one minute and its bacterial content was then found to be 4080 per cubic centimeter. After twenty-four hours at room-temperature it was 7,000,000 per cubic centimeter.

"A hair from a cow's flank was put into 500 c.c. of sterile milk. After shaking the milk for one minute it contained 52 bacteria per cubic centimeter. After twenty-four hours at room-temperature it contained 55,000 per cubic centimeter, and after thirty-six hours, over 5,000,000 bacteria per cubic centimeter."

The results of the foregoing observations are given in detail, in order to impress upon the reader the necessity of exerting his energies to the end that the infants under his care may receive a less contaminated milk-supply.

Market Milk.—The legal standards for pure milk in most instances relate only to the chemical composition of the milk. The laws of most of the States call for 12 per cent. of total solids, and at least 3 per cent. of fat. If the milk contains less than these percentages, it is considered impure, even if it is just as it was when it left the cow's udder. Some cows give milk considerably below this standard. The chemical analysis of milk does not show whether it is suitable for use as an infant food, this point being decided according to its freshness and the care with which it has been handled with reference to the exclusion of bacteria

and the prevention of their growth. The production of clean, safe milk is expensive. It costs at least two cents a quart to produce milk, without allowing anything for the labor of caring for the cows. The milk must be carried to the consumer, which is also expensive. Yet, in New York city, milk that satisfies the legal requirements retails in the grocery stores, during the summer months, at 3½ cents a quart—two quarts for 7 cents. This milk is known as "grocery milk," and is a very poor food for infants. It is teeming with bacteria, as little care is taken in its production.

The next grade of milk is sold in quart bottles which have been filled in the country, packed in cracked ice, and shipped to the city. The milk contains many bacteria, but is far better than grocery milk. It is retailed to the consumer for about 8 cents a quart.

Certified Milk.—The best grade of milk, and the one which should be used in feeding infants whenever possible is known as "certified milk," and is produced under the direction of what is known as a "milk commission." The establishing of "milk commissions" in different cities throughout the country has been the means of securing a much better milk-supply than was formerly possible, and has unquestionably been instrumental in saving thousands of lives. To Dr. H. L. Coit, of Newark, N. J., is due the credit of organizing the first milk commission. Certified milk must conform to certain standards as to its nutritional value and as to the number of bacteria per cubic centimeter. These standards are established by a committee of medical men who compose the milk commission, and who have complete control of the dairy and its entire output.

The Milk Commission of the New York County Medical Society requires a standard of milk not containing over 30,000 bacteria in a cubic centimeter. When a dairyman has shown to the satisfaction of the Commission that he can produce a milk up to the required standard, he is allowed to attach to his bottles milk labels furnished by the Commission certifying to that fact. Milk thus "certified" is taken from the delivery wagon from time to time and subjected to examination by their bacteriologist in order to determine whether it conforms to the requirements of the Commission. In order to show the care and supervision necessary for the production of certified milk, the requirements of the Milk Commission of the New York County Medical Society for the Production of "certified milk" are given in full.*

"The most practicable standard for the estimation of cleanliness in the handling and care of milk is its relative freedom from bacteria. The Commission has tentatively fixed upon a maximum of 30,000 germs of all kinds per cubic centimeter of milk, which must not be exceeded in order to obtain the indorsement of the Commission. This standard must be attained solely by measures directed toward scrupulous cleanliness, proper cooling, and prompt delivery. The milk certified by the Commission must contain not less than 4 per cent. of butter-fat on the

* Chapin: "Infant Feeding."

average, and must possess all the other characteristics of pure, wholesome milk.

"In order that dealers who incur the expense and take the precautions necessary to furnish a truly clean and wholesome milk may have some suitable means of bringing these facts before the public, the Commission offers them the right to use caps on their milk-jars stamped with the words: 'Certified by the New York County Medical Society Milk Commission.'

"**Rules for the Producer.**—1. *The Barnyard.*—The barnyard should be free from manure and well drained, so that it may not harbor stagnant water. The manure which collects each day should not be piled close to the barn, but should be taken several hundred feet away. If these rules are observed not only will the barnyard be free from objectionable smell, which is always an injury to the milk, but the number of flies in summer will be considerably diminished. These flies, in themselves, are an element of danger; for they are fond of both filth and milk, and are liable to get into the milk after having soiled their bodies and legs in recently visited filth, thus carrying it into the milk. Flies also irritate cows, and by making them nervous reduce the amount of their milk.

"2. *The Stable.*—In the stable the principles of cleanliness must be strictly observed. The room in which the cows are milked should have no storage loft above it; where this is not feasible, the floor of the loft should be tight, to prevent the sifting of dust into the stable beneath. The stable should be well ventilated, lighted, and drained, and should have tight floors, preferably of cement. They should be whitewashed inside at least twice a year, and the air should always be fresh and without bad odor. A sufficient number of lanterns should be provided to enable the necessary work properly to be done during dark hours. There should be an adequate water-supply and the necessary wash-basins, soap, and towels. The manure should be removed from the stalls twice daily, except when the cows are outside in the fields the entire time between the morning and afternoon milkings. The manure gutter must be kept in a sanitary condition, and all sweeping and cleaning must be finished at least twenty minutes before milking, so that at that time the air may be free from dust.

"3. *Water-supply.*—The whole premises used for dairy purposes, as well as the barn, must have a supply of water, absolutely free from any danger of pollution with animal matter, sufficiently abundant for all purposes, and easy of access.

"4. *The Cows.*—The cows should be examined at least twice a year by a skilled veterinarian. Any animal suspected of being in bad health must be promptly removed from the herd, and her milk rejected. Never add an animal to the herd until it has been tested for tuberculosis and it is certain that it is free from disease. Do not allow the cows to be excited by hard driving, abuse, loud talking, or any unnecessary disturbance. Do not allow any strongly flavored food, like garlic, which will affect the flavor of the milk, to be eaten by the cows.

"Groom the entire body of the cow daily. Before each milking

wipe the udder with a clean damp cloth, and, when necessary, wash it with soap and clean water and wipe it dry with a clean towel. Never leave the udder wet, and be sure that the water and towel used are clean. If the hair in the region of the udder is long and not easily kept clean, it should be clipped. The cows must not be allowed to lie down, after being cleaned for milking, until the milking is finished. A chain or rope must be stretched under the neck to prevent this.

"All milk from cows sixty days before and ten days after calving must be rejected.

"5. *The Milkers.*—The milker should be personally clean. He should neither have nor come into contact with any contagious disease while employed in milking or handling milk. In case of any such illness in the person or family of any employee in the dairy, such employee must absent himself from the dairy until a physician certifies that it is safe for him to return.

"Before milking, the hands should be thoroughly washed in warm water with soap and a nail-brush and well dried with a clean towel. On no account should the hands be wet during the milking.

"The milking should be done regularly at the same hour morning and evening, and in a quiet, thorough manner. Light-colored, washable outer garments should be worn during milking. They should be clean and dry, and when not in use for this purpose, should be kept in a clean place protected from dust. Milking-stools must be kept clean. Iron stools painted white are recommended.

"6. *Helpers, Other than Milkers.*—All persons engaged in the stable and dairy should be reliable and intelligent. Children under twelve years should not be allowed in the stable during milking, since in their ignorance they may do harm, and from their liability to contagious diseases they are more apt than older persons to transmit them through the milk.

"7. *Small Animals.*—Cats and dogs must be excluded from the stable during the time of milking.

"8. *The Milk.*—The first few streams from each teat should be discarded, in order to free the milk-ducts from milk that has remained in them for some time and in which bacteria are sure to have multiplied greatly. If, in any milking, a part of the milk is bloody or stringy or unnatural in appearance, the whole quantity of milk yielded by that animal must be rejected. If any accident occurs by which the milk in a pail becomes dirty, do not try to remove the dirt by straining, but reject all the milk and cleanse the pail. The milk-pails used should have an opening not exceeding eight inches in diameter.

"Remove the milk of each cow from the stable, immediately after it is obtained, to a clean room, and strain it through a sterilized strainer.

"The rapid cooling of milk is a matter of great importance. The milk should be cooled to 45° F. within one hour. Aëration of pure milk beyond that obtained in milking is unnecessary.

"All dairy utensils, including bottles, must be thoroughly cleansed and sterilized. This can be done by first thoroughly rinsing in warm

water, then washing with a brush and soap or other alkaline cleansing material and hot water, and thoroughly rinsing. After this cleansing, they should be sterilized with boiling water or steam, and then kept inverted in a place free from dust.

"9. *The Dairy.*—The room or rooms where the bottles, milk-pails, strainers, and other utensils are cleaned and sterilized should be separated somewhat from the house, or when this is impossible, have at least a separate entrance, and be used only for dairy purposes, so as to lessen the danger of transmitting through the milk contagious diseases which may occur in the home.

"Bottles, after filling, must be closed with sterilized discs and capped so as to keep all dirt and dust from the inner surface of the neck and mouth of the bottle.

"10. *Examination of the Milk and Dairy Inspection.*—In order that the dealers and the Commission may be kept informed of the character of the milk, specimens taken at random from the day's supply must be sent weekly to the Research Laboratory of the Health Department, where examinations will be made by experts for the Commission, the Health Department having given the use of its laboratories for this purpose.

"The Commission reserves to itself the right to make inspections of certified farms at any time and to take specimens of milk for examination. It also reserves the right to change its standards in any reasonable manner upon due notice being given the dealers."

Naturally, milk produced in this way is more expensive than when little or no care is used, more help is required, and help of a more expensive type. Certified milk, or its equivalent, is sold in New York city at prices ranging from 12 to 18 cents a quart.

Examination of Cow's Milk.—In the use of cow's milk, as in that of human milk, a chemical analysis is necessary, in order to know accurately the nutritional elements. The specific gravity varies from 1.029 to 1.035. Milk is acid in reaction to phenolphthalein, and may be neutral to litmus. The Babcock milk-test machine is what is generally employed in examining cow's milk in laboratories and institutions. The test consists in mixing the milk with strong sulphuric acid, which dissolves the proteids and liberates the fat, the quantity of which is read off from the graduated neck of the bottle used in mixing the milk and acid. Only the fat is determined in this way. Knowing the fat and the specific gravity, one may readily determine the solids other than fat by adding to one-fourth of the specific gravity, reading to the right of the decimal point, one-fourth of the percentage of fat.

MODIFIED MILK

At one time it was thought that, by changing the percentage composition of cow's milk and altering the reaction, it could be made practically identical with human milk, and the term "modified milk" was applied to cow's milk so manipulated. A great variety of manipula-

tions of cow's milk has been introduced, which often differ greatly in the principles involved. Yet to products of all these different manipulations the term "modified milk" is applied. It may mean any one of a dozen or more different products. Cow's milk diluted with water and given as a food to an infant is called "modified milk." When sugar, cereal gruel, lime-water, bicarbonate of sodium, or citrate of sodium is added, it is still "modified milk." When a prescription is sent to the laboratory calling for definite amounts of fat, sugar, and proteids, the product furnished is "modified milk." When a mother is told to use a definite amount of cream, milk, sugar, and water, "modified milk" is also the outcome.

As a matter of fact, successful infant-feeding consists in what I have termed "milk adaptation," that is, modifying the milk to suit the case in hand. The routine prescriber is content to prescribe "modified milk," that which was originally supposed to be an imitation of human milk. The best-informed prescriber uses "an adapted modified milk" which he decides is indicated.

The analysis of mixed dairy milk shows it to contain approximately:

4.0 per cent. fat.
4.0 per cent. sugar.
3.5 per cent. total proteid.

Human milk contains approximately:

4.0 per cent. fat.
7.0 per cent. sugar.
1.5 per cent. total proteid.

The Aim of Milk Modification.—The first aim in the modification is to make the chief nutritional elements in the food prepared from cow's milk correspond grossly to the nutritional elements in the human milk. The proteid must be reduced, the sugar increased, and the fat reduced even slightly below that usually found in mother's milk, as the child's digestive capacity for cow's-milk fat is less by from 15 to 25 per cent. than it is for human milk.

The Proteid.—The proteid element in an infant's food is its chief nutritional content. This has to be reduced to approximately the proportions that exist in human milk, and the change can be accomplished only by dilution. The diluent may be plain water or it may be a cereal gruel. The average cow's milk contains, as just mentioned:

4.0 per cent. fat.
4.0 per cent. sugar.
3.5 per cent. total proteid.

If 8 ounces of milk is mixed with 8 ounces of water, we get a pint mixture with an approximate nutritional equivalent of:

2.0 per cent. fat.
2.0 per cent. sugar.
1.75 per cent. total proteid.

If 4 ounces of milk is mixed with 12 ounces of water, we have a 16-ounce mixture with an approximate nutritional equivalent of:

1.0 per cent. fat.
1.0 per cent. sugar.
0.9 per cent. total proteid.

If 6 ounces of milk is mixed with 10 ounces of water, a 16-ounce mixture is produced with an approximate nutritional equivalent of:

1.5 per cent. fat.
1.5 per cent. sugar.
1.3 per cent. total proteid.

By this simple dilution with water the desired proteid content of the food may be arrived at.

The Sugar.—For nourishment for an infant, however, the mixture is weak in fat and very weak in sugar. The sugar content is increased by the addition of milk-sugar or cane-sugar. It will be remembered that in human milk there is a sugar content of 7 per cent. The combination of full cow's milk and water as above gives a sugar content of 2 per cent. or less, so that sufficient sugar must be added to make the increase approximately 7 per cent. What is necessary, then, is to increase the sugar content 5 per cent. A 1 per cent. sugar and water mixture would contain approximately 5 grains of sugar to the ounce. A 6 per cent. sugar mixture would contain 30 grains to the ounce, and as our dealings are with a 16-ounce mixture, we require an addition of 16 times 30 grains of sugar-of-milk, or 480 grains, so that if we direct that a pint mixture contain 6 ounces of a 4–4–3.50 milk, 10 ounces water, 1 ounce milk-sugar, there would be an approximate nutritional equivalent of:

1.5 per cent. fat.
7.5 per cent. sugar.
1.3 per cent. total proteid.

Or if the mixture were 4 ounces milk, 12 ounces water, 1 ounce milk-sugar, there would be an approximate nutritional equivalent of:

1.0 per cent. fat.
7.0 per cent. sugar.
0.9 per cent. total proteid.

The Fat.—While a child of from two to four months might thrive on the above formulas, the fat is obviously deficient and must be increased. This is accomplished by the use of cream. Cream of the same age as the milk should be used. When this method of feeding is carried out, in order to secure a suitable cream, a quart bottle of milk from a mixed herd of grade cows is allowed to stand at a temperature of 40° or 50° F. for five hours, when a cream which will be referred to as

"*gravity cream*" (p. 107) will be produced of the approximate strength of:

16.0 per cent. butter-fat.
3.2 per cent. sugar.
3.2 per cent. total proteid.

These were the percentages obtained in an analysis made for me from the Walker-Gordon Laboratory milk, which is produced by grade cows and has an average milk strength as regards the nutritional elements, and may therefore be taken as a guide in using gravity cream for infant-feeding. Cream from well-fed Jersey cows procured in this way will contain from 20 to 24 per cent. of fat. One ounce of gravity cream with 15 ounces of water gives a pint mixture with a nutritional equivalent of:

1.0 per cent. fat.
0.2 per cent. sugar.
0.2 per cent. total proteid.

Two ounces of gravity cream and 14 ounces of water give an approximate nutritional equivalent of:

2.0 per cent. fat.
0.4 per cent. sugar.
0.4 per cent. total proteid.

Fig. 8.—The Chapin dipper.

We now wish by using gravity cream (see p. 107) to raise the fat in the milk and sugar-water mixtures given above. In using the cream, all must be removed and mixed, as the upper layers in the bottle are much richer in fat than those nearer the milk. For this skimming process the Chapin dipper (Fig. 8) is employed. Milk which is rapidly cooled immediately after being drawn and kept at a temperature of 50° F. or lower may be skimmed at the end of five hours, when all the cream that will rise will have done so.

ILLUSTRATIVE FOOD FORMULAS

			Approximate Percentage Equivalent.	
Gravity cream	1	ounce	Fat	2.0
Milk	4	ounces	Sugar	7.2
Milk-sugar	1	ounce	Total proteid	1.1
Water	11	ounces		

			Approximate Percentage Equivalent.	
Gravity cream	2	ounces	Fat	3.0
Milk	4	ounces	Sugar	7.4
Milk-sugar	1	ounce	Total proteid	1.3
Water	10	ounces		

In the event of a weak proteid digestion in a young baby, gravity cream alone may be used temporarily; thus 3 ounces cream, 1 ounce milk-sugar, 12 ounces water, 1 ounce lime-water, which mixture gives an approximate nutritional equivalent of:

3.0 per cent. fat.
6.6 per cent. sugar.
0.6 per cent. total proteid.

Or if a weaker food is desired for a younger infant, we may use 2 ounces gravity cream, 1 ounce milk-sugar, 13½ ounces water, ½ ounce lime-water, which mixture gives an approximate equivalent of:

2.0 per cent. fat.
6.4 per cent. sugar.
0.4 per cent. total proteid.

In the event of a good proteid digestion and poor fat digestion, full milk along with sugar and water should be used; thus 5⅓ ounces milk, 10 ounces water, 1 ounce milk-sugar, 1⅔ ounces lime-water, which mixture gives an approximate equivalent of:

1.33 per cent. fat.
7.33 per cent. sugar.
1.17 per cent. total proteid.

Average skimmed milk with the gravity cream removed contains about 1 per cent. fat, 3.5 per cent. sugar, and 3 per cent. proteid. If for any reason a particularly weak fat food is required, skimmed milk may be used: 5⅓ ounces skimmed milk, 9 ounces water, 1 ounce milk-sugar, 1⅔ ounces lime-water, which mixture gives an approximate equivalent of:

0.33 per cent. fat.
7.17 per cent. sugar.
1.00 per cent. total proteid.

If a stronger skimmed milk mixture is required, it may be prepared as follows: 8 ounces skimmed milk, 8 ounces water, 1 ounce milk-sugar, which mixture gives an approximate nutritional equivalent of:

0.50 per cent. fat.
7.75 per cent. sugar.
1.50 per cent. total proteid.

It will thus be seen that with milk, cream, and sugar-of-milk, food of every possible strength may be made. If lime-water is used, it simply takes the place of the milk diluent and replaces so much water. This method of milk preparation is more accurate than when top-milk mixtures are used, but it has the disadvantage of requiring two quarts of milk during the entire feeding period, one to supply the milk and the other the cream, all of which must be removed and mixed before any of it is used in the food.

The following formulas for the different ages may be found useful for well babies:

From the first to the third day:

Milk-sugar ..... ½ ounce
Boiled water ..... 16 ounces
¼ to 1 ounce every two or three hours

which mixture gives an approximate nutritional equivalent of 3 per cent. sugar.

From the third to the tenth day:

		Approximate Percentage Equivalent.	
Gravity cream	½ ounce	Fat	1.25
Milk	3 ounces	Sugar	6.85
Milk-sugar	1 ounce	Total proteid	0.75
Lime-water	½ ounce		
Boiled water to make	16 ounces		

Ten feedings in twenty-four hours; 1 to 1½ ounces at each feeding.
One ounce = 12.8 calories.

From the tenth to the twenty-first day:

		Approximate Percentage Equivalent.	
Gravity cream	1¼ ounces	Fat	1.7
Milk	5 ounces	Sugar	7.0
Milk-sugar	1½ ounces	Total proteid	0.89
Lime-water	½ ounce		
Water to make	24 ounces		

Nine to ten feedings in twenty-four hours; 1½ to 2 ounces at each feeding.
One ounce = 14.4 calories.

From the third to the sixth week:

		Approximate Percentage Equivalent.	
Gravity cream	2½ ounces	Fat	2.25
Milk	8 ounces	Sugar	7.25
Milk-sugar	2 ounces	Total proteid	1.13
Lime-water	2 ounces		
Water to make	32 ounces		

Eight to nine feedings in twenty-four hours; 2 to 3 ounces at each feeding.
One ounce = 16.6 calories.

From the sixth week to the third month:

		Approximate Percentage Equivalent.	
Gravity cream	3 ounces	Fat	2.6
Milk	9 ounces	Sugar	7.4
Milk-sugar	2 ounces	Total proteid	1.3
Lime-water	2½ ounces		
Water to make	32 ounces		

Seven to eight feedings in twenty-four hours; 2½ to 4 ounces at each feeding.
One ounce = 18 calories.

From the third to the fifth month:

		Approximate Percentage Equivalent.	
Gravity cream	4 ounces	Fat	3.1
Milk	15 ounces	Sugar	6.8
Milk-sugar	2 ounces	Total proteid	1.6
Lime-water	4 ounces		
Water to make	40 ounces		

Six to seven feedings in twenty-four hours; 4 to 5 ounces at each feeding.
One ounce = 18.9 calories.

From the fifth to the seventh month:

		Approximate Percentage Equivalent.	
Gravity cream	5 ounces	Fat	3.6
Milk	18 ounces	Sugar	6.6
Milk-sugar	2 ounces	Total proteid	1.9
Lime-water	5 ounces		
Water to make	42 ounces		

Six feedings in twenty-four hours; 5 to 7 ounces at each feeding.
One ounce = 20.5 calories.

After the fifth month it is my custom to add from one to three teaspoonfuls of a cereal jelly to each feeding. This may be added to the milk mixture when it is made in the morning. Thus, if one teaspoonful is to be given at each feeding, where a child is getting six feedings, six teaspoonfuls of the jelly may be added to the entire quantity.

From the seventh to the ninth month:

Gravity cream	6 ounces	Approximate Percentage Equivalent.	
Milk	23 ounces	Fat	3.9
Milk-sugar	2 ounces	Sugar	6.5
Lime-water	6 ounces	Total proteid	2.1
Water to make	48 ounces		

Five to six feedings in twenty-four hours; 6 to 8 ounces at each feeding. Five feedings in twenty-four hours usually answer better at this age.
One ounce = 21.4 calories.

From the ninth to the twelfth month:

Gravity cream	7 ounces	Approximate Percentage Equivalent.	
Milk	32 ounces	Fat	4.28
Lime-water	6 ounces	Sugar	7.25
Milk-sugar	2½ ounces	Total proteid	2.4
Water to make	56 ounces		

Five to six feedings in twenty-four hours; 7 to 9 ounces at each feeding.
One ounce = 23.8 calories.

Top-milk Feeding.—In using top-milk for infant-feeding the milk is allowed to stand in a quart bottle at a temperature of 45° to 50° F. for the same length of time as when gravity cream is desired—five hours. The quantity needed is then removed from the top of the bottle with a Chapin dipper (Fig. 8) and diluted as desired with water or gruel to which sugar-of-milk and lime-water are added. The milk selected should be the cleanest obtainable from grade cows; usually the most expensive is the best. If so-called "certified milk" (p. 54) is obtainable, it should be used, as this warrants a cleaner food than that afforded by the usual market milks.

From a quart bottle of milk on which the cream has risen, dip from the top with a Chapin dipper 16 ounces and mix. From average milk this should contain:

7.0 per cent. fat.
3.2 per cent. sugar.
3.2 per cent. total proteid.

The following top-milk formulas are suggested for the various ages noted:

From the third to the tenth day:

Milk (top 16 oz.)	3 ounces	Approximate Percentage Equivalent.	
Lime-water	½ ounce	Fat	1.3
Milk-sugar	1 ounce	Sugar	6.6
Boiled water to make	16 ounces	Total proteid	0.6

Ten feedings in twenty-four hours; 1 to 1½ ounces at each feeding.
One ounce = 12.5 calories.

From the tenth to the twenty-first day:

Milk (top 16 oz.)	6 ounces	Approximate Percentage Equivalent.	
Lime-water	1½ ounces	Fat	1.75
Milk-sugar	1½ ounces	Sugar	6.8
Water to make	24 ounces	Total proteid	0.8

Nine to ten feedings in twenty-four hours; 1½ to 2 ounces at each feeding.
One ounce = 14.2 calories.

From the third to the sixth week:

Milk (top 16 oz.)	10 ounces	Approximate Percentage Equivalent.	
Lime-water	2½ ounces	Fat	2.2
Milk-sugar	2 ounces	Sugar	7.0
Water to make	32 ounces	Total proteid	1.0

Eight to nine feedings in twenty-four hours; 2½ to 3 ounces at each feeding.
One ounce = 16 calories.

From the sixth week to the third month:

Milk (top 16 oz.)	12 ounces	Approximate Percentage Equivalent.	
Milk-sugar	2 ounces	Fat	2.6
Lime-water	3 ounces	Sugar	7.2
Water to make	32 ounces	Total proteid	1.2

Seven to eight feedings in twenty-four hours; 2½ to 4 ounces at each feeding.
One ounce = 17.5 calories.

From the third to the fifth month:

After this age two bottles of milk are required, 16 ounces being taken from the top of each bottle and mixed. At this time a cereal jelly is usually added to the food.

Milk (top 16 oz.)	18 ounces	Approximate Percentage Equivalent.	
Milk-sugar	2 ounces	Fat	3.15
Lime-water	4 ounces	Sugar	6.4
Water to make	40 ounces	Total proteid	1.4

Six feedings in twenty-four hours; 4 to 5 ounces at each feeding.
One ounce = 18.3 calories.

From the fifth to the seventh month:

Milk (top 16 oz.)	21 ounces	Approximate Percentage Equivalent.	
Milk-sugar	2 ounces	Fat	3.50
Lime-water	5 ounces	Sugar	6.4
Water to make	42 ounces	Total proteid	1.6

Six feedings in twenty-four hours; 5 to 7 ounces at each feeding.
One ounce = 19.6 calories.

From the seventh to the ninth month:

Milk (top 16 oz.)	27 ounces	Approximate Percentage Equivalent.	
Milk-sugar	2½ ounces	Fat	3.9
Lime-water	6 ounces	Sugar	7.0
Water to make	48 ounces	Total proteid	1.8

Five to six feedings in twenty-four hours; 6 to 8 ounces at each feeding.
One ounce = 21.7 calories.

From the ninth to the twelfth month:

Milk (top 16 oz.)	35 ounces	Approximate Percentage Equivalent.	
Milk-sugar	2½ ounces	Fat	4.3
Lime-water	6 ounces	Sugar	6.5
Water to make	56 ounces	Total proteid	2.0

Five to six feedings in twenty-four hours; 7 to 9 ounces at each feeding.
One ounce = 22.4 calories.

After the twelfth month, plain cow's milk may be given with the cereal jelly in addition to the other articles of diet suggested for a child one year old. (See p. 97.)

Considerable latitude is allowed as to the amount of food which may be given at each feeding, because of the difference in the capacity of individual children. It will be observed that the total quantity of

food prepared is several ounces more than the amount which the child will ordinarily take in twenty-four hours. This extra amount often serves a most useful purpose when a bottle is broken or the food is otherwise lost. The average well child will require daily about 30 ounces of a suitably adapted food at the third month, about 36 ounces at the sixth month, and 40 to 45 ounces at the ninth to the twelfth month.

Night Feedings.—After the third month the midnight feeding should be discontinued. Six feedings are sufficient, the first at 6 A. M. and the last at 10.30 or 11 P. M.

Between 11 P. M. and 6 A. M. the child should sleep. Babies are easily weaned from the night bottle by substituting a bottle of boiled water or a milk mixture greatly diluted with water. The child soon discovers that this is not worth waking for. As a result of a full night's rest the digestive organs are better able to do their work, the appetite is increased, and a large amount of food may be given at each feeding.

Changes Needed for Special Symptoms.—When milk does not agree, the cause must be discovered. The food as a whole may be too strong, when there will be indigestion and colic, and possibly *diarrhea and vomiting*. If the food contains too much fat, there will be *looseness of the bowels and colicky stools*, with considerable straining, and there is frequently *regurgitation*. Sometimes sugar is a cause of trouble, indications of excess being the *eructation of gas* and *regurgitation of sour, watery material*. The fat and sugar rarely cause any disturbance if they are given with any degree of intelligence; but the casein, the curd-forming element in cow's milk, often gives us no end of trouble. Many infants, as previously stated, are able to digest only a very little cow's-milk casein; consequently, at the beginning of cow's-milk feeding, when, as is often the case, too much milk is used—too strong a food given—the result is always disastrous. This, with too frequent feedings and night feedings, comprises the chief error made in cow's-milk feeding—in fact, such errors cause more bottle-feeding failures than all other factors combined.

The Quality of Milk Variable.—It is not claimed that the nutritional value as indicated by the percentage equivalents in either of the above series is absolutely correct. Milks necessarily differ in composition. Only mixed dairy milk is referred to, the product of several grade cows. The feeding of the cows and their care also influence the quality of the milk. The percentages given indicate approximately the nutritional value and are sufficiently accurate for purposes of supplying satisfactory nutrition to well babies of the various ages, as I have abundantly proved to my own satisfaction. The fat will not be found too low for proper nutrition in any of the formulas given. It may be too high for proper digestion and require adjustment. The proteids as given are sufficient for nutrition if they are assimilated. They also may require reduction to meet special conditions which are referred to under Milk Adaptation (p. 70). The adjustment of the food to the individual constitutes what I have termed "milk adaptation," and

suggestions for making the food fit the child's digestive capacity will be found under that caption.

Laboratory Feeding.—To Rotch, of Boston, we are indebted for the establishment of the practice of thinking in percentages in the feeding of infants, and for the establishment of milk laboratories which mark an epoch in the feeding of infants.

Laboratory feeding, however, is available for but few. Modification of milk in the home must be the means of preparing foods for the vast majority of infants.

The following is a recipe blank used for laboratory feeding:

WALKER-GORDON LABORATORY CO.

℞ Per Cent.

Fats . . . . . .

(a) Carbohydrates { Lactose (Milk Sugar) / Maltose (Malt Sugar) / Sucrose (Cane Sugar) / Dextrose (Grape Sugar) / Starch . . . . . }

(b) Dextrinize . . . . . .

(c) Proteids { Whey / Casein . . . . . }

(d) Peptonize . . . . . .

(e) Sodium Citrate . . { % of milk and cream / % of total mixture }

(f) Sodium Bicarb. . . { % of milk and cream / % of total mixture }

(g) Lime Water . . . . { % of milk and cream / % of total mixture }

(h) Lactic Acid Bacillus { 1 To inhibit the saprophytes of fermentation / 2 To facilitate digestion of the proteids }

Heat at _____ °F. _____

Number of Feedings _____

Amount of each Feeding _____ oz.

ORDERED FOR

_____

ADDRESS _____

DATE _____ 19

_____ M. D.

NOTE.—See back of pad.

A Convenient Means for Home Modification.—A measuring glass has recently been placed on the market, known as the Deming percentage milk modifier (Fig. 9). The device is a pint graduate provided with a column of figures in red representing percentages of proteid, and several other columns representing percentages of fat. The fat percentages in one column are to be obtained by using whole milk; in another, 7 per cent. milk; in another, 10 per cent., etc. At the head of each column are

directions showing how such milk may be obtained from a quart bottle of milk. The figures representing proteid percentages are so placed on the glass that when milk is poured into the graduate up to the level of any set of figures and diluent is added up to the 16-ounce mark, the resulting mixture will contain a percentage of proteid corresponding to the red figure at the first level and a percentage of fat corresponding to the figures at that level in the column which represents the kind of milk used. For example, if whole milk is poured in up to the red (proteid) mark "2" and diluent is added to 16 ounces, the fat percentage will be 2.5, which is the figure at the same level as the proteid percentage, and under the whole-milk column. Or if 7 per cent. milk is used, 4.4 per cent., and if 10 per cent., 6.2 per cent., etc.

The Feeding of Dispensary Patients.—The feeding of cow's milk according to one or more of the above methods is the best means of furnishing infant nutrition. The laboratory, the milk and cream, and the top-milk methods, all pediatrists are agreed, have proved the best means of applying substitute feeding. That a great majority of infants may be fed in this way, if they are properly handled by a suitable adjustment, there is not the slightest doubt; but where there is a majority, there is also a minority, and a goodly portion of this minority who reside in large cities and the suburbs of large cities fall into the hands of the pediatrist either in hospital, in out-patient, or in private work. Economic questions oftentimes govern the selection of the food. Physicians who have an invariable system of feeding must of necessity have but one type of patients to deal with.

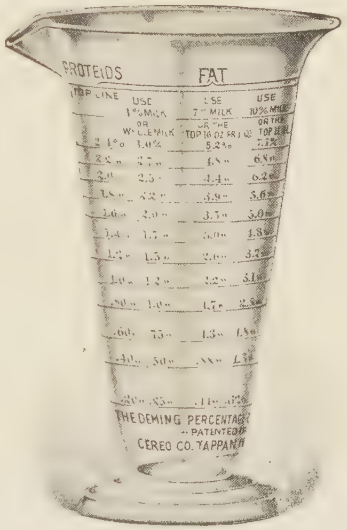


Fig. 9.—Deming's milk modifier.

However loud we may be in our advocacy of the ennobling principles of democracy, we cannot treat alike, as regards their feeding, all well children even in private practice. The child of a stupid mother cannot be fed as well or in the same way as the child of a reasonably intelligent mother in the same station of life. An infant of a very poor mother, whether she is dull or intelligent, cannot be fed to the infant's best advantage, for the reason—a very simple but effectual one—that the mother cannot afford cow's milk. For the out-patient class in New York city, the expensive milk is therefore entirely out of the question. I have treated many infants whose parents could not expend eight cents daily for a quart of milk.

The Patient's Limitations and How to Meet Them.—The Straus laboratories, which supply *pasteurized milk* to the poor of New York

city, excellent as they are, are available to comparatively few. *Milk and cream combinations* are often not available because of expense or because of inability of the mother to appreciate and carry out the details required for their proper use, so that in the out-patient poor class we are compelled to feed either by top-milk methods or by the simple dilution of full milk with water and sugar or with a cereal gruel and sugar, while for the very poor, those who cannot afford fresh milk and ice, we are forced to use *condensed milk*. *The top-milk method* is available to but comparatively few of these mothers, even though the directions are carefully explained and printed instructions used. The use of top milks, while very simple, is not readily understood, and has usually been unsatisfactory. The dipper, a useful portion of the equipment, is an extra utensil to be kept clean. Women who do all their own housework, take care of their own children, and perhaps take in outside work have but little time for attention to the details of infant-feeding. The easiest way, naturally, has for them many attractions. Among these mothers my best success has been gained by the use of *full milk*. They know how to shake the bottle and measure out the milk and mix it with water or barley-water in the amount to be fed to the baby. This is very easily done, and further than this their comprehension frequently does not extend.

As will readily be perceived, diluted full milk is a food poor in fat. This we endeavor to make up by using three times a day one-half teaspoonful or one teaspoonful of pure cod-liver oil, for which there is no charge at the dispensary.

The following formulas and instructions for bottle-feeding are taken from the "Rules for the Care of Infants and Young Children," which were formerly used in my service at the out-patient department of the Babies' Hospital, and give the simplest and easiest means of bottle-feeding:

"*Bottle-feeding.*—The bottle should be thoroughly cleansed with borax and hot water (one tablespoonful of borax to a pint of water) and boiled before using. The nipple should be turned inside out, scrubbed with a brush, using hot borax water. The brush should be used for no other purpose. The bottle and nipple should rest in plain boiled water until wanted. Never use grocery milk. Use only bottled milk which is delivered every morning. From May 1st to October 1st the milk should be boiled five minutes immediately after receiving. Children of the same age vary greatly as to the strength and amount of food required. A mixture, when prepared, should be put in a covered glass fruit-jar and kept on ice. For the average baby the following mixtures will be found useful:

"*For a Child Under Six Weeks of Age.*—Nine ounces of milk, 27 ounces of barley-water, 4 teaspoonfuls of granulated sugar. Feed from 2 to 3 ounces at two and one-quarter hour intervals—9 feedings in twenty-four hours.

"*Sixth to the Twelfth Week.*—Twelve ounces milk, 24 ounces barley-water, 5 teaspoonfuls sugar. Feed from 3 to 4 ounces at each feeding.

"*Third to the Sixth Month.*—Eighteen ounces of milk, 30 ounces of barley-water, 6 teaspoonfuls of sugar. Feed 4 to 6 ounces at three-hour intervals—7 feedings in twenty-four hours.

"*Sixth to the Ninth Month.*—Twenty-four ounces milk, 24 ounces barley-water, 6 teaspoonfuls granulated sugar. Feed 6 to 8 ounces at three-hour intervals—6 feedings in twenty-four hours.

"*Ninth to the Twelfth Month.*—Thirty-eight ounces milk, 12 ounces barley-water, 6 teaspoonfuls granulated sugar. Feed 7 to 9 ounces at three and one-half hour intervals—5 feedings in twenty-four hours.

"*Condensed Milk.*—When the mother cannot afford to buy bottled milk from the wagon, when she has no ice-chest or cannot afford to buy ice, she should not attempt cow's-milk feeding, but may use canned condensed milk as a substitute during the hot months only. The can, when opened, should be kept in the coolest place in the apartment, carefully wrapped in clean white paper or in a clean towel. The feeding hours are the same as for fresh cow's milk.

"*Under Three Months of Age.*—Condensed milk, ½ to 1 teaspoonful; barley-water, 2 to 4 ounces.

"*Third to Sixth Month.*—Condensed milk, 1 to 2 teaspoonfuls; barley-water, 4 to 6 ounces.

"*Sixth to Ninth Month.*—Condensed milk, 2 to 3 teaspoonfuls; barley-water, 6 to 8 ounces.

"*Ninth to Twelfth Month.*—Condensed milk, 3 teaspoonfuls; barley-water, 8 to 9 ounces."

A cereal water is used as a diluent in all these cases, as it increases the nutritional value of the food. One-half ounce barley flour to a pint of water gives a nutritional equivalent of:

0.07 per cent. fat.
0.3 per cent. total proteid.
2.0 per cent. carbohydrate.

Changes Needed in Hot Weather.—It will be seen, as previously stated, that the foregoing whole-milk formulas are poor in fat. Nevertheless, they afford as much fat as the average tenement child can safely digest during the hot months without danger of diarrhea. During the cooler months of the year the child is given pure cod-liver oil from the dispensary in order to make up for the deficient fat content of the food. During the eight months from October 1st to June 1st the child is fed in this way. About June 1st the ability of the family to care for the milk during the hot weather is ascertained. If they have ice-boxes and can afford ice they are instructed to continue with the milk, but instead of giving it raw, as previously, they are told to boil it three minutes. When they cannot supply sufficient ice to care for the milk, they are assigned to the condensed-milk class. A fairly satisfactory infant milk may be obtained in New York city for 9 cents a quart. There are parents in New York, however, who cannot afford even this daily expenditure for the infant's milk, or who claim that they cannot, which amounts to the same thing, as far as the infant is concerned. The

infant has to be fed. A 10-cent can of condensed milk will last an infant three days, and will keep safely for use for that length of time after opening. A cereal-water diluent is always added to the milk in order to increase its nutritive value, and pure cod-liver oil furnished by the dispensary is given eight months in the year to increase the daily amount of fat. This, of course, is anything but ideal infant-feeding. Many children thrive under this method, however, although they almost invariably show some signs of malnutrition, and offer impaired resistance to illness of every nature. In spite of these drawbacks, under existing conditions in New York city such food is the best for a considerable number of children during the summer months.

Adapted Milk.—In adapting milk for infant-feeding the milk must not only be "modified" (p. 57), by which process the nutritional elements are changed in their proportions so as to make them conform as nearly as possible to mother's milk, but more is required—the food must be adapted to the child's digestive capacity.

If the modification of milk, as we formerly understood, constituted all that was required in infant-feeding, the artificial feeding of infants would be a comparatively simple matter. Some infants will take readily any reasonable modification which by experience has been found suitable for children of their age. The majority, however, who are fed on cow's milk, must be fed according to their digestive capabilities. Every feeding case must be studied from the individual standpoint. How best to nourish the individual can be learned only by a study of the patient himself. No process of manipulation by the addition of chemicals or gruels can convert cow's milk into human milk. Various means, however, are available sufficient to overcome the existing differences, thereby making a suitable food even for those who at first show signs of marked intolerance of cow's milk. The strength of the food and the feeding intervals required for average well children of the different ages are given in the chapters on Modified Milk, p. 57.

Symptomatic Adaptation.—If the child is getting a food of suitable strength at proper intervals and becomes ill, the food as a whole may be beyond his digestive capacity, or there may be an incapacity for one or more nutritional elements. If the food as a whole is too strong, there is very commonly vomiting, which may become habitual, or there may be colic or constipation or diarrhea. If the food as a whole is too weak, the fact will be evidenced by hunger, failure to gain in weight, and usually by constipation. If sugar is given in excess—a comparatively rare cause of trouble, if not more than 7 per cent. of milk-sugar is given—it will be indicated by the regurgitation of sour, watery material. A sour odor to the patient's breath and clothing indicates sugar excess. There may not be pronounced vomiting in such a case, but the repeated regurgitation when the patient is awake is sufficient to deprive him of a goodly amount of his daily food. The digestion of both fat and proteid may be markedly interfered with, and the whole digestion deranged as a result of what was primarily a sugar incapacity or sugar excess. When sugar is at fault, the indigestion may readily

be corrected by washing out the stomach for a few days (p. 756) and by reducing the sugar content of the food one-half. Later, after the condition is relieved, the sugar may gradually be increased to the normal percentage of 7. A child may be getting but a 2 per cent. cow's-milk-fat mixture and yet suffer from fat-indigestion. Excessive fat or fat incapacity also gives rise to vomiting and regurgitation in which particles of fat may often be seen. Fat, moreover, may cause frequent green, undigested stools, the passage of which is associated with marked tenesmus. Fat-diarrhea is often the outcome of fat-indigestion. Cow's-milk fat was not intended for babies, and when it disagrees—since we cannot change its character—our only method of adaptation is to reduce the amount given, as with the sugar.

Casein.—The casein in cow's milk is its important nutritional constituent, and in adapting cow's milk to a child's digestive capacity the casein is oftentimes a most difficult factor to deal with. Temporarily it may be reduced with safety to a percentage below that of cow's milk—to 0.25 per cent., for instance—but it must be remembered that the patient cannot thrive or even long exist without this proteid element in the diet, so that a reduction will always be followed by malnutrition. It is necessary, then, to give proteid, and successful infant-feeding means that we must adapt the proteid to the child's digestive capacity. This, fortunately, is oftentimes possible.

The Use of Alkalis and Antacids.—The casein of human milk when it enters the infant's stomach separates into small, flocculent masses. Cow's milk entering the infant's stomach, without an addition of an alkali or other modifying medium, is precipitated by the pepsin in the stomach and forms a heavy curd, consisting of paracasein, which fails of digestion or assimilation, and at which the child's stomach oftentimes rebels. The adaptation of the casein of cow's milk to the child's digestive capacity, so as to maintain suitable nutrition, is a central point around which the whole subject of infant-feeding revolves. It will be noted in the formulas for cow's-milk feeding for different ages that lime-water is used as a diluent. This is used not simply as a diluent of cow's milk nor to render the milk alkaline, as has frequently been stated; it is used to prevent the coagulation of the casein and the resulting formation of tough curds of paracasein. Simple dilution with water may make a smaller curd, but does not produce the flocculent character peculiar to human milk that follows the addition of alkalis and antacids to cow's milk. In the presence of an alkali the casein does not combine with the acid in the stomach; consequently the resulting acid coagulation does not take place. For this reason alkalis and antacids are added to cow's milk.

Poynton, of London, advocates the use of citrate of soda with a view to preventing the solid coagulation of the casein. It is claimed that by using citrate of soda, 1 grain to the ounce, sodium paracasein is produced, which is a fluid. Citric acid is liberated and unites with the calcium, forming the citrate of calcium, which is absorbed.

Signs of indigestion of the casein in the milk are usually pain and

discomfort. There are usually acute attacks of colic. There may be constipation, or diarrhea alternating with constipation, associated with the passage of many hard curds in the stools, the patient losing steadily in weight. In such instances the best means of adaptation consists in reducing the amount of proteid to a total of 1 per cent. by dilution with water, and the addition of sufficient alkalis, such as lime-water, bicarbonate of soda, or citrate of soda, to form a curd more readily attacked by the digestive juices. The writer feeds many hundreds of infants yearly, and is not in accord with the belief, which is now fashionable, that the casein of cow's milk is a factor of no importance in the adaptation of cow's milk.

Whey-feeding.—Whey mixtures may be of temporary use in these cases. In whey the casein is largely removed—about 0.3 per cent. remaining. Analyses of whey show a nutritional equivalent of about:

0.5 per cent. fat.
0.9 per cent. lactalbumin.
0.3 per cent. casein.
4.5 per cent. sugar.

As whey is ordinarily made, it is impossible to obtain a lower percentage of casein than 0.25. The amount of casein will oftentimes reach 0.5 per cent. unless it is heated and strained a second time. The deficiency in fat may be overcome by adding gravity cream (p. 107) of the same age as the milk from which the whey is obtained, in the proportion of one or two ounces to a pint of whey. This, of course, carries with it a very small amount of casein, which may make a total beyond the child's digestive capacity. Low proteid must be given only during acute illness or indigestion, and should be a diet for temporary purposes until the child is able to care for more suitable nourishment.

Adaptation by the Use of Cereal Gruels.—It is claimed by many excellent observers that the use of cereal gruels causes a mechanical division of the casein, and it is thus more readily acted upon by the digestive juices. While I use gruels largely as milk diluents, and frequently as milk substitutes, I have yet to be convinced that in difficult feeding cases they possess any great value in the adaptation of milk to the child's digestive capacity. They are valuable adjuncts to the diet in cases in which weak milk foods must be given, but I do not recall, nor can I find among my records, an instance in which I thought the use of a stronger casein possible because of the cereal-water diluent. Repeated trials with gruels in feeding delicate or in marasmic infants, who afford the crucial tests in any milk adaptation, have never enabled me to give a stronger milk proteid because of the presence of the cereal. Having fed gruels as diluents in a large number of cases for years, I have had abundant opportunity to see enormous curds vomited and passed by the rectum by children on a milk and gruel diet in spite of test-tube demonstrations representing the process of curdling which takes place in the stomach and showing a minute division of the curd

when the milk was treated with gruels. The advantage of a cereal diluent lies in the fact that a greater amount of food is thereby given.

The following figures give an idea of the increase in proteids and carbohydrates occasioned by the use of gruels made from Cereo Co.'s barley- and oat-gruel flours (1 ounce or 4 level tablespoonfuls to the quart of gruel). The amount of proteids in these flours is higher than in the other flours on the market:

Proportion of Milk in Mixture	PROTEIDS		CARBOHYDRATES	
	Water Diluent	Gruel Diluent	Water Diluent	Gruel Diluent
one-eighth	0.40 per cent.	0.82 per cent.	0.60 per cent.	2.7 per cent.
one-quarter	0.80 per cent.	1.16 per cent.	1.20 per cent.	3.0 per cent.
three-eighths	1.20 per cent.	1.50 per cent.	1.80 per cent.	3.6 per cent.
one-half	1.60 per cent.	1.80 per cent.	2.50 per cent.	3.7 per cent.
five-eighths	2.00 per cent.	2.02 per cent.	3.00 per cent.	4.0 per cent.

In using these gruel diluents, only about one-half as much sugar should be added to the mixtures as when water diluent is employed.

Adaptation through Peptonization.—When a child has incapacity for cow's milk to such a degree that he is not able to take milk properly diluted and given at suitable intervals, peptonization (p. 80) may aid us, although I have frequently been sorely disappointed in its use. Theoretically, peptonization—the predigestion of the food—should be a solution of many digestive problems. Its efficiency in actual use can be learned from mortality statistics of children under two years of age in large cities, an immense proportion of the deaths being due either primarily or secondarily to nutritional errors. Not every infant, of course, is given peptonized milk; but if it possessed the value claimed for it by some of its advocates, the demand would be such as to compel its universal use, and difficult feeding cases would be no more.

Each year I treat perhaps five or six cases of indigestion, in which peptonization is unquestionably valuable. In using peptonized milk the proteid strength should be reduced to 1 per cent.—the lowest point compatible with safety. The amount and intervals of feeding should correspond with those suggested for the age of the patient. I have found the following method best: Fifteen minutes before nursing the bottle is removed from the ice and from one-eighth to one-fourth of a tube (Fairchild's peptonizing tube), depending upon the amount of milk in the bottle, is added. The bottle is then placed in water sufficiently heated—110° to 120° F.—to make it the right temperature for a child at the end of ten minutes. The degree of the temperature of the water must of necessity vary according to the temperature in the bottle and the amount to be heated.

Malt-soup Feeding.—The use of Loefflund's malt-soup extract (a preparation of malt and potassium carbonate), Keller's formula, offers a most satisfactory method of making cow's-milk assimilable. It is not well borne in vomiting cases nor those in which there is a tendency to looseness of the bowels. When either of these conditions exists skimmed milk may be temporarily substituted.

In following this method of feeding the milk strength considered suitable for the condition and age of the child may be used. Lime-water is not employed because of the presence of carbonate of potash in the malt. The malt and the flour, a considerable portion of the latter having been dextrinized, take the place of milk or cane-sugar in the food mixture.

The chief use of this food is in malnutrition cases, in slow-growing infants, who though not actually ill, fail to show a satisfactory growth on any other food given. Time and again I have seen these children show surprising increase in weight without change in the milk strength when the malt-soup with its wheat flour accompaniment was used. In treating bottle-fed infants who suffer from colic and marked constipation due to casein incapacity this food has a considerable field of usefulness.

Malt-soup extract is not to be used in the strength indicated on the bottle, as the amount is entirely too high. I have found the following method the most satisfactory: For a 30-ounce mixture, dissolve 1 ounce of the malt extract in the amount of water used. Mix and blend from 1 to 2 ounces of flour by measure with the milk, cream, or top-milk required. If there is abdominal distention and flatulence or other evidence of carbohydrate incapacity, the amount of flour should be reduced perhaps one-half. The milk and flour mixture is to be strained and added to the solution of malt and water. It should then be placed over a slow fire and "simmered" for thirty minutes, with constant stirring.

In the event of constipation continuing, the amount of malt used may be doubled. Excess of malt, however, may produce vomiting, so that any increase should be made with caution.

Eiweiss Milch (Protein Milk).—The Eiweiss Milch of Finkelstein and Meyer is prepared as follows:

One junket tablet is added to one quart of milk; allow to stand at 98° F. until the milk coagulates; strain through gauze, wash the curd with boiled water, put curd through strainer twice; add this curd, so treated, to one pint of fat-free lactic acid milk, and then add water to make one quart.

During my 1910 summer service at the Babies' Hospital, Eiweiss Milch was used extensively. Its use was attempted in 40 cases. The milk was employed *first* as a means of feeding difficult feeding cases; *second*, as a milk substitute in acute intestinal disease.

In cases of the former class, the feeding cases, the results were not satisfactory. In other words, the babies thrived far better on our usual milk modifications.

In the second class of cases, in which proteid milk was used as a substitute for ordinary milk during acute intestinal disease, our results may be said to have been uniformly satisfactory. Proteid milk is well taken by most infants after a few trials. It is usually well retained. The stools improve rapidly under its use, becoming yellow and smooth. It constitutes a means of nutrition, which may be brought into use

much earlier than plain modified cow's milk, thus taking the place of the cereal decoctions.

Our plan in a given case of acute intestinal intoxication is as follows: Two teaspoonfuls of castor oil are given. This is followed by plain barley-water, one ounce to the pint, for twenty-four hours. At the end of this time, regardless of the character of the stools, the Eiweiss Milch is introduced. From 1 to 4 ounces are given at a feeding, and when small quantities are given, each feeding is supplemented with as much barley-water as the child will take.

Children kept on the Eiweiss Milch for a considerable period rarely continued to do well, so that cow's milk was resumed as soon as it was thought safe.

Another method consists in giving the Eiweiss Milch diluted with barley-water in the proportion of one part of milk to two or three parts of barley-water.

The Calorimetric Standard.—The calorimetric standard in its relation to infant-feeding was not included in my first edition because I desired this to be a practical work without fanciful theories. Numerous writers claim that the use of this standard has been of value to them, and the omission from the first edition has been noticed by different reviewers.

In brief, the calorimetric standard is based upon the amount of energy indicated in calories for each pound of body weight. A calorie is the amount of heat required to raise the temperature of one liter of water 1° C.

Heubner, of Berlin, several years ago began the employment of calorimetric principles in infant-feeding. His original observations, which were made on healthy breast-fed infants, weighed before and after each feeding, showed that under six months 100 calories were required daily for every kilogram of body weight. After the sixth month, the number of calories required gradually lessened, so that at the completion of one year about 85 calories to each kilogram of body weight appeared to be necessary.

Lamb* has reduced Heubner's figures to pounds. He gives the calorimetric requirements during the first three months of life as 45 calories daily per pound of body weight, during the next three months from 40 to 45 calories daily per pound, decreasing gradually during the next six months, so that at the twelfth month from 32 to 35 calories daily per pound of body weight are necessary.

Heubner's observations, upon which the standard is based, as mentioned above, were made on thriving breast babies. In order to judge of its practical value in artificial feeding the histories of 33 bottle-fed infants were selected at random, from my files, for investigation. It was found that every child was getting food of greater caloric value than the standard called for. All but two required food in caloric value exceeding 100, as set by the standard. The daily consumption of 31 of these splendidly thriving infants, all of whom continued to do well, was from

* Archives of Pediatrics, June, 1908.

140 to 360 calories in excess of the Heubner standard. But 33 histories were investigated.

I am confident that I have hundreds of records showing the same result. The calorimetric standard is to me a means of little utility in infant-feeding. It might aid as a check to excessive feeding in very young and delicate infants. Infants whom I see—and they differ not at all from the average infants in this country—cannot be thus fed to the best advantage.

CEREAL GRUELS; STARCH-FEEDING

Much discussion has taken place during the past few years concerning the use of cereals in infant-feeding.

The cereals consist of plant embryos surrounded by a mass of highly nutritious proteids and carbohydrates in the form of starch, which nourishes the embryonic plant until it becomes rooted in the ground. As the developing plant needs nourishment it converts the starch into dextrin and maltose. Cereals are analogous to eggs in that the germ is packed away in a supply of exceedingly nutritious food, which in the process of development it converts into tissue. Almost all of the prepared infant foods are made from cereal flours, with or without the addition of a little dried milk or sugar; or from cereals in which the starch has been transformed into dextrin and maltose. The proprietary meal foods, which consist of baked flours of different kinds, are useful aids in infant-feeding and most useful as milk substitutes when milk must temporarily be withheld. The conversion of starch into dextrin by the baking process is so slight that it may be ignored. Robinson's barley flour, Cereo Co.'s barley flour and the other gruel flours, and Imperial Granum (baked wheat flour) require boiling before use. They may be prepared according to the instructions given in the formulary (p. 104).

It is my custom in bottle-feeding to begin with a cereal from the fifth to the seventh month, by using a cereal water *as a diluent of the milk mixture*. For this purpose barley or granum is usually employed. Very often in out-patient work I begin with a cereal diluent very early in life in order *to make the food mixture more nutritious*. This method of feeding is useful when accurate modifications are not possible and when the child for any reason cannot take a milk formula as strong as age and nutritional requirements demand. Such cases are frequently seen in the marasmic, the malnutrition, and the difficult feeding class. The addition of two or three tablespoonfuls of flour to the daily food will increase its nutritive value not a little. That boiled starch may be digested by the youngest and most marasmic infant has been proved under my own observation.

The principal use of these flours, however, is in the treatment of gastro-enteric diseases, where cereal may with safety replace the milk for considerable periods of time. By eliminating milk from the diet and giving carbohydrates, a putrefactive culture-field is removed and a less favorable soil is furnished for the development of the intestinal

bacteria; further, there are no by-products formed to produce intestinal toxemia or kidney irritation. Two even tablespoonfuls of these flours to one pint of water give approximately a food strength of 0.07 per cent. fat, 0.3 per cent. proteid, 2 per cent. carbohydrate. In order to increase the nutritive value, cane-sugar may be added in sufficient quantity to bring the carbohydrate percentage up to 5. The addition of the sugar also makes the cereal more palatable, and therefore more acceptable to the patient.

During an invasion of scarlet fever, pneumonia, or any of the illnesses of childhood which may be accompanied by great prostration, the usual foods, whatever their nature, should be withheld, and the cereal gruel alone or mixed with chicken or mutton broth used as a very satisfactory substitute. Likewise later in the disease it is never well to give full milk while fever and prostration are present. Cereal gruels are especially serviceable as diluents of the milk in conditions where this combination must often furnish the nutrition for days. The use of the baked-flour gruels, with sugar or without, as a means of nutrition should be continued only during the active symptoms of the disease, whether it is scarlet fever or one of the intestinal diseases. In no sense are these gruels advocated as exclusive foods for infants or for growing children. I have seen many cases in which this error has been made with most disastrous results.

The Infant's Capacity for Starch Digestion Proved by Experiment.— It has been claimed with more or less tenacity by different writers that the young infant possesses no capacity for starch digestion. Two years ago a study of starch digestion in infants of different ages was undertaken at my suggestion at the New York Infant Asylum. In the first series of 60 cases, 324 stool examinations were made for purposes of observation on exclusively starch-fed children.

Boiled barley flour was given in the form of a gruel in amounts of from 142 to 1560 grains in twenty-four hours, the usual quantity being from 400 to 500 grains. In testing for starch in the stools, the von Jaksch iodin method was employed. In 33 cases the stools were persistently negative, 5 examinations being made on five successive days; of these, 11 were under six months of age. One infant nineteen days old took 142 grains of starch daily, and the stools were negative to the 2 examinations made on two successive days. One, twenty-one days old, took 225 grains every twenty-four hours. To one, five months and twenty-six days old, 375 grains daily were given. In each of these cases 5 examinations were made, all being negative. To one infant, five and a half months of age, 450 grains were given for three successive days. It was then decided to increase the starch and test his digestive capacity. There were accordingly given him 1560 grains daily for two days. The stools failed to respond to the iodin test. One patient, aged one month and twenty-two days, was thin and had diarrhea. Four hundred grains were given the first day, followed by a negative stool. Three hundred and ninety grains were given on each of four successive days, the stools remaining negative. To another

child, one month and nineteen days old, 185 grains were given for three days, with stools negative. The starch was then increased to 300 grains for two days, the stools still remaining negative. In 7 cases the stools were persistently positive, showing the presence of starch in considerable amount at each examination. In 20 cases the reactions were sometimes positive and sometimes negative. Of the 60 cases in question, 41 showed a good starch capacity and 19 an indifferent or poor starch capacity. That some of the starch may have undergone fermentation in the intestine is, of course, possible. However, this could not have been a factor of great consequence, for the patients did not show more than the usual bowel distention. Dextrin was present at times in over one-half the cases,thus showing only a partial conversion from the presence of a starch enzyme. In all those children subjected to the test, a fair degree of nutrition was maintained during the period of the exclusive starch diet. Several of the starch-fed infants in which the stools were negative to iodin were very young and very delicate. This led us to undertake a study of the stools of infants fed exclusively on the breast, with a view of determining, if possible, the presence of starch-digesting enzyme or enzymes in the feces, 161 tests being made of the stools of 26 children. The ages were: under two weeks, 22; between one and two months, 3; two and one-half months old, 1. The tests were conducted as follows: A solution of starch, 1:500, was boiled for fifteen minutes. From 1 to 4 drams of this solution were then put into a test-tube, and to this a dilute Lugol solution was added and the tube marked for control. To another boiled solution of starch of similar strength Fehling's solution was added to determine the presence of sugar, which, of course, was absent. In another tube a portion of feces in plain boiled water was tested for sugar and always found negative. The observations were thus protected by three controls. In still another tube an equal amount of a 1:500 starch solution was boiled for fifteen minutes and a definite amount by weight of feces was added. The tube was then thoroughly shaken and placed in a water-bath, which was maintained at a temperature of 100° F. for one-half hour. The solution was then tested for sugar with Fehling's solution. In every case the presence of sugar was indicated, thus proving the presence of something in the feces which transformed the starch into maltose. The observations agree with those of von Jaksch, who proved the presence of a starch-converting ferment in 28 out of 30 cases, and with those of Moro, who proved the same fact in 38 out of 40 cases.

It was found that the converting capacity of the feces for starch was in the proportion of about $\frac{1}{20}$ grain of starch to 1 grain of feces, this amount being required for the complete conversion of the starch into sugar. In 1 case there was a capacity of but $\frac{1}{60}$ grain of starch to 1 grain of feces. In 3, 1 grain of feces converted $\frac{1}{10}$ grain of starch. When stronger starch solutions were used, there was a response both with the Lugol and Fehling solutions, showing a partial conversion. In 3, the examinations began on the day of birth and were continued for several days, 4 examinations being made in each case. Six were

commenced on the second day and continued for four days. One premature baby (eight months), who lived six days and weighed 4 pounds 4 ounces, showed a power of conversion of 1 grain of feces to $\frac{1}{32}$ grain of starch.

Excluding bacteria of feces and the ptyalin of the saliva, it would seem that the succus entericus and the pancreatic juice were responsible for the very active diastatic ferment.

Zweifel and Korwin were unable to extract a diastatic enzyme from the pancreas in infants under three weeks old, and concluded, therefore, that none existed. Their methods cannot be accepted at the present time as establishing this point, as the glands were macerated and placed in distilled water, in some instances for only one-half hour, and then mixed with a strong starch solution. Moro followed along the lines laid down by Zweifel by using distilled water, though the maceration was continued for a much longer time, and in 7 of 10 infants under three months of age proved the existence of a diastase in the pancreatic extract. Two of these infants died at birth. One lived fourteen days. Four were between one and three months of age. We now know that much stronger extracts of the pancreas are to be obtained when the organ is cut into small pieces, ground with sand in a mortar, and macerated in a solution of 15 per cent. alcohol or 40 per cent. glycerin. Furthermore, it is not logical to compare with a dead organ the active functionating pancreas of a living child, under the stimulating influence of food in the intestine. Our own observations as to the elaboration of pancreatic extract and the succus entericus have not been carried far enough to warrant any authoritative statement based on the findings; but the claim that the diastase is furnished by the mother's milk is disproved to a great extent by the fact that the feces extract from meconium stools was found as active before breast-feeding as later.

It will be seen from the foregoing that the majority of infants of tender age are able to digest starch. Not every infant has this capacity, and, according to this report, starchy foods thus resemble every other substitute food. Not every infant by any means can take cow's milk or ass's milk or goat's milk; but that starchy foods may be added with benefit to infant milk foods in a great majority of the cases, and that cereal may be used with benefit as a substitute for milk foods in illness, is established, both experimentally and clinically, beyond all question.

The above observations have been confirmed by Hess,* of New York, in the use of duodenal catheterization. Hess found pancreatic ferments in infants varying in age from a few hours to a year, some of whom were normal, others ailing. The material was examined for amylase, lipase, and for trypsin. Hess writes as follows:

"A considerable number of new-born infants were tested before they had been put to the breast. It is of physiologic rather than of clinical interest to note that without the stimulus of food to incite secretion the three pancreatic ferments were found in the intestine.

"During the first week of life the amount of the pancreatic secretion

* "American Journal Diseases of Children," October, 1912.

is still very scanty, but it contains the starch-splitting enzyme with increased regularity.

"In older infants, a month or more of age, there is both an increase in the quantity of pancreatic juice and a decided augmentation of its amylolytic power. This is a most remarkable functional activity, and one difficult of biologic explanation; for to what purpose is the starch-splitting ferment adapted at this age? It would seem as if an infant was furnished with enzymes competent to digest not only its natural food, mother's milk, but also artificial food. This amylase has the power of digesting a 1 per cent. starch solution, or, for example, barley-water, and, therefore, bears out the old contention of Jacobi* and of Heubner† that food containing starch can be utilized by the infant in the first month of life."

PEPTONIZED MILK

Milk is peptonized, or predigested, for the purpose of partially or completely digesting the proteid before it is given to the patient. As a means of assistance in making a milk food assimilable the usefulness of peptonization is limited. The process referred to (p. 73) has been the one most successful with me. So-called complete peptonization produces a product with a decidedly bitter taste, which few children will take. Peptonized milk, however, has other uses than as a means of daily feeding. Peptonized milk in which there is a complete conversion of the casein has been most useful in two types of cases:

For Gavage.—During acute or chronic illness when a child cannot take food by the natural method, as in diphtheric paralysis, or when he will not swallow on account of an acute inflammatory disease of the throat, such as peritonsillitis, retropharyngeal abscess, or retropharyngeal adenitis, or when he is in a comatose condition from any cause except intestinal infection, the feeding of completely peptonized milk by gavage (p. 758) is of inestimable value.

For Nutrient Enema.—In conditions when stomach-feeding is impossible either by gavage or the natural method—conditions met with in persistent vomiting due to acute cerebral diseases, in recurrent vomiting, in acute gastric indigestion—and as an accessory means of feeding when sufficient nourishment cannot be taken by the stomach, the colon-feeding of completely peptonized, skimmed milk has a decided field of usefulness, and in this way I often employ it. Feeding children by means of the bowel, however, is usually possible for a few days only, because of the local irritation produced by the nutriment and by the passage of the tube. Skimmed milk, peptonized, with the addition of the white of egg makes the best nutrient enema that I have used (p. 121). It should be given at a temperature between 90° and 95° F. at from six- to eight-hour intervals. The tube should be introduced at least 9 inches. In cases of recurrent vomiting I have repeatedly seen both hunger and

* Jacobi, A.: "Gerhardt's Handbuch," etc., 1876, i.

† Heubner, O.: "Berl. klin. Wochenschr.," 1895, p. 201.

thirst relieved by feeding in this way. The following are the different methods for the peptonization of milk:

Peptonization.—*Immediate Process.*—Fifteen minutes before feeding add from $^1/_8$ to $^1/_4$ of the contents of a Fairchild peptonizing tube to the milk mixture which is in the nursing-bottle ready for use. Place the bottle in water at a temperature of from 110° to 120° F., and let it remain until fifteen minutes have elapsed. The amount of the powder used and the degree of heat of the water depend, of course, upon the amount of milk in the nursing-bottle.

Cold Process.—Put 4 ounces of cold water into a clean quart bottle and dissolve in it, by shaking thoroughly, the powder contained in one of the Fairchild peptonizing tubes; add a pint of cold fresh milk, shake the bottle again, and immediately place it upon ice—directly in contact with it.

The bottle should always be well shaken before and after pouring out a portion of its contents.

Partially Peptonized Milk.—Put 4 ounces of cold water and the powder contained in one of the Fairchild peptonizing tubes into a clean saucepan, and stir well; add a pint of cold fresh milk and heat with constant stirring to the boiling-point. The heat should be so applied that the milk will come to a boil in ten minutes. Let it cool until lukewarm, then strain into a clean bottle or glass jar, cork tightly and keep in a cold place. The bottle or jar should always be well shaken before and after pouring out a portion.

Partially peptonized milk, if properly prepared, will not become bitter.

Completely Peptonized Milk.—Put 4 ounces of cold water and the powder contained in one of the Fairchild peptonizing tubes into a clean quart bottle and shake thoroughly; add a pint of cold fresh milk and shake again; then place the bottle in a pail or kettle of warm water at about 115° F., or not too hot to immerse the hand in it without discomfort. Keep the bottle in the water-bath for thirty minutes. Put it immediately upon ice—directly in contact with it.

Disorders of Nutrition

MARASMUS (ATHREPSIA; INFANTILE ATROPHY)

Under the title of marasmus will be considered those cases which are associated with and dependent upon derangement of function of the gastro-enteric tract. Tuberculosis, syphilis, and atelectasis are consequently excluded, these affections being considered elsewhere under their respective headings.

Age.—Marasmus is seen most frequently in young infants under nine months of age. Cases are frequently seen, however, from the ninth to the twelfth month, and comparatively few between the twelfth and eighteenth months.

Pathology.—There is no lesion or set of lesions peculiar to infantile atrophy. I have personally autopsied a large number of cases. There

is usually a strip of hypostatic pneumonia, perhaps a large area of atelectasis. Now and then the liver is fatty or shows fatty areas. The spleen, kidneys, and heart are pale. The stomach and intestines contain thick, sticky mucus, which when removed shows a pale, washed-out-appearing mucous membrane. Blood infections with the pyogenic cocci have explained the etiology in several recent cases.

Etiology.—A great deal of research work has been done among marasmic infants in order to determine the nature of the condition, but as yet no satisfactory explanation has been offered. The disease is unquestionably due to defective intestinal assimilation. The principal fact that disproves the existence of any atrophic condition or any necessarily severe derangement of function is that these patients very often make complete recoveries, becoming perfectly normal children after three months or more of treatment.

The Usual History.—The history of these cases is as follows: The mother could not or did not nurse the baby. The child was put on cow's milk, which was usually given too strong or in too large quantities —oftentimes both errors were combined, or the milk may have been too old when used, and improperly cared for; in any case the milk disagreed, the child was made ill, there was loss in weight, cow's milk was discontinued, and one of the infant foods, alone or combined with milk, was given; but the child's digestion being thoroughly disordered, the foods failed to agree. There was vomiting or regurgitation, with undigested, green stools, or both combined, while the loss in weight continued. The child may have been inherently weak or may have shown a cow's-milk idiosyncrasy to help account for the lack of success in the milk-feeding. Usually there followed a series of experiments with different kinds of food and methods of feeding, the vomiting, diarrhea, or colic continued with wasting, and when the child reached the hospital or office he was perhaps six months of age and weighed from 6 to 9 pounds, presenting a typical athreptic picture. Some of these children are born with a digestion that is apparently incompatible with cow's-milk mixtures. Others have their digestive capacity for cow's milk hopelessly deranged by improper feeding methods. The majority of the cases occur among the overcrowded tenement poor—the worst possible environment for a delicate infant. There is little or no proteid assimilation, so that any approximation to normal growth is impossible. They may also possess a poor fat capacity, and if there is also a diminished sugar capacity the proteids of the tissues are drawn upon to supply heat and energy, with resulting progressive emaciation. Heredity, environment, and the season of the year all influence the prognosis.

Infection as a Cause of Marasmus.—In our management of athreptics we have been so occupied with nutrition and the gastro-intestinal tract, other possible etiologic agencies may have been neglected. Occult infections may and do play a very decided part in some of these cases. Thus during a recent service at the Babies' Hospital, out of 17 cases in which blood cultures were made, 5 were positive, and of these 5 infants, 4 died. Of the remaining 12 negative cases, 8 died, and of the 4 that

recovered 1 had an otitis; and 1, a furunculosis of mild degree, while the remaining 2 had no demonstrable lesions. Of the 8 fatal cases, there were only 2 in which there was no evident infection. The infection varied from an otitis to a severe bronchopneumonia.

The blood cultures in each case were taken when the infant was losing in weight and apparently retrogressing without any digestive disturbances. In two instances the clinical evidence (if it might be called such) was manifested by a subnormal temperature, well-digested stools, and progressive loss in weight. In two others there existed a temperature and later signs of a bronchopneumonia, while a third showed Klebs-Löffler bacilli in the nose. Blood counts were of no aid in diagnosis.

Marasmic infants who fail to thrive on suitable food and good general management, whether there are evident digestive disturbances or none, should be thoroughly examined for hidden infections. In not a few of those who show progressive loss in weight there has been a suppurative otitis without active symptoms. In others there has been a bacteremia, the only symptom being that of progressive loss in weight.

Treatment.—An important determining factor as to the child's future depends upon whether or not he can have the advantage of a wet-nurse. That a great majority of the cases of simple athrepsia recover, and often recover promptly, making a most satisfactory growth, when a wet-nurse is secured, is proof, as above stated, that the condition, so far as relates to any peculiar systemic state or pathologic condition, depends more upon the nature of the nutrition than upon the patient. In securing a wet-nurse the physician's duties are by no means completed. The patient may not take kindly to the breast, and will have to be taught breast-nursing. A great deal of time may be required in teaching older infants, those who have been on the bottle for seven or eight months. To this end, various devices may have to be used. For the first nursing it is well to allow the child to go for an hour or two beyond the feeding-time in order that his appetite may be voracious. It is advisable also to give the first few nursings in a darkened room with the person who has been accustomed to feeding the patient very near. Sufficient milk should be forced from the breast to enable the child to taste it. A little powdered sugar sprinkled on the nipple is a good means of increasing his interest. In some instances it has been necessary to cover the wet-nurse with a blanket or sheet, leaving only the breasts exposed; or it may be necessary to use the nipple-shield (Fig. 1) for a few days in order gradually to accustom the child to the change. I have yet to see a case in which success did not follow persistent effort. Oftentimes the nurse's milk will not agree at first; but this is not surprising and need cause no discouragement. Breast-milk ordinarily is a much stronger food than the child has been accustomed to, and it may produce vomiting, colic, or diarrhea. When indigestion follows, the nurse's milk should be modified by giving the baby weak barley-water or plain boiled water, before the nursing in case he nurses well, or after the nursing in case he nurses poorly. One or two ounces of breast-

milk at a feeding is all that these patients can be expected to take during the first few days. The amount obtained may readily be determined by weighing the patient, without the trouble of undressing him, before the nursing, and then weighing him at intervals of from three to five minutes after the nursing has commenced. An ounce of breast-milk is practically an ounce avoirdupois. These children, if not too weak, will take greedily almost anything from the bottle. The addition of an ounce or two of barley-water or plain water dilutes the milk and renders it easier of digestion, and furnishes at the same time the necessary fluid for the child. The most unpromising cases of marasmus are not to be despaired of nor the treatment relaxed, although the physician should be cautious in his prognosis. If the child is too weak or indifferent to swallow, the wet-nurse's milk may be expressed, diluted, and given by gavage. I have in a few instances peptonized the wet-nurse's milk. In many cases evaporated milk (see p. 114) may be used successfully for marantic infants. It is much easier of digestion than fresh cow's milk, and is a temporary measure of much value.

Hospitals and institutions for children always carry a certain number of these unpromising cases. It is not infrequent to find miliary tuberculosis at autopsy where it was not suspected during life, no clinical signs of fever having been present.

Illustrative Case.—The most pronounced and the most hopeless recovery case coming under my observation was seen by me in consultation in one of the suburbs of New York. The child was four months old and weighed 5 pounds. He was emaciated to a skeleton, having weighed 8 pounds at birth. The temperature for several days ranged between 92° and 94° F. A trained nurse and an unusually intelligent mother were in charge. I doubted the accuracy of the thermometer reading, and different thermometers were used. The temperature was taken by the rectum. I took the temperature on one or two occasions with my own thermometer and found the reading correct. The attending physician had also taken it repeatedly, so that finally there was no doubt. The child was too weak to nurse. The breasts were accordingly pumped, and for each feeding he was given one-half ounce of breast-milk with an ounce of barley-water, to which a few drops of sherry wine were added. This was given by gavage at two-hour intervals. He was wrapped in flannel and wool and surrounded with hot-water bottles. The food was retained and digested. In four days he could nurse, and was allowed to take a small amount from the breast and finish the meal with barley-water. The temperature gradually rose to the normal. More breast-milk was allowed as he proved able to care for it, and the child made a perfect recovery, weighing 18 pounds when he was nine months old.

This case demonstrated to me that a marasmic child is never a hopeless case until he ceases to live. Unfortunately, very few marantic children can have the benefit of a wet-nurse, but without a wet-nurse many of these cases are not hopeless. The use of condensed milk (p. 114) and malt soup (p. 113) will furnish a satisfying diet in not a few cases. The condition is, of course, a very serious one, but the chances are much better in a reasonably good home than in a hospital, where the story is often as follows: The patients take the modified milk or whatever is given them without inconvenience. The stools may be offensive if cow's milk is given, or there may be constipation, or the stools may appear perfectly normal. As a rule, there is no serious

diarrhea or any other evidence of an acute inflammatory process in the intestine. However, in spite of fairly normal stools, the patient grows thinner and thinner. After a time all food is refused, gavage is used as a last resort, and the child finally dies. The autopsy shows nothing but pale organs, with perhaps a strip of hypostatic pneumonia. Now and then one of these cases in a children's institution or in a hospital recovers without a wet-nurse, but it is the exception proving the rule. Put these athreptics on a wet-nurse, as I do at every opportunity, and many of them thrive in spite of the well-known unfavorable influence exerted by institutional life upon the very young. In addition to putting the athreptic baby on the wet-nurse, his stomach should be washed once daily and he should live out-of-doors.

Outdoor Life.—Next to the wet-nurse, I know of no agent fraught with so much good as is outdoor life. The season of the year exerts considerable influence on the prognosis. The athreptic bears the heat and humidity very badly, and the early summer mortality of all large cities is materially increased by these children, who wilt and die in institutions and tenements with the first two or three days of continuous hot weather. Parents residing in a large city who can so afford should send such children to the country not later than June 1st, to return, in this latitude (New York city), not earlier than October 1st. During the day the child should be on a porch or in the shade continuously. At night the windows of his sleeping-room should be wide open. During the cooler months if the child is too ill to be taken out of doors he should have from morning until evening a continuous indoor airing (p. 20). The sleeping-room should always communicate with the open air. The roof-garden in large cities is a most valuable aid in the management of athreptic children.

Cases in Which a Wet-nurse is Impossible.—While much has already been said about this most interesting and important subject, one phase has not been touched upon. I refer to the athreptic infant of the tenement, and those others in private life for whom a wet-nurse is impossible. They furnish by far the largest number of our marasmic patients. Perhaps the most frequent error in the management of these cases is an endeavor to select at the start a food for the child to *thrive* upon. In doing this, almost invariably a stronger food is selected than the child is capable of digesting, and he is made worse by the attempt. Our ultimate object in treating these infants will be more readily attained if, at first, we attempt only to supply a food upon which they *can exist* without loss in weight. The number of calories necessary for an athreptic child is not great. It must be remembered, furthermore, that we are not dealing with a case of infant-feeding as the term is commonly understood. True, we are feeding an infant, but a sick infant, and the methods of feeding used for the comparatively well do not apply here in all respects. The problem of nourishing these children is to be considered from two standpoints—that of the food and that of the baby, with special reference to the organs of digestion. The stomach, in many of these infants, is dilated, with a consequent

lack of motility. Residual undigested food remains long after feeding. There has been a constant fermentative change, with the production of lactic and butyric acids, resulting in local changes of an inflammatory nature in the mucous membrane of the stomach, so that not only must the organ be prepared for the food, but the food must be adapted to the stomach capacity, and when this is done,—when both requirements receive due consideration,—we are much more likely to succeed.

Stomach-washing.—In all of these cases, for the first few days of treatment, I wash out the stomach with sterile water, regardless of the presence of vomiting and regurgitation and regardless as to whether the child is bottle-fed or breast-fed. It is often surprising to note the amount of thick mucus and undigested food that will be washed from a stomach from which there has never been vomiting. The daily washings enable the child to take more food and stronger food. It may be necessary to continue the washings for days. They may first be discontinued when the water siphons clear and without mucus. They should be repeated if there are indications, such as regurgitation of sour water or mucus or loss of appetite. In a case seen recently in which there was chronic gastritis with athrepsia, washings were continued at gradually lengthened intervals for six months.

Feeding.—If the case is one with pronounced stomach involvement, a 3 per cent. milk-sugar solution is given for twenty-four hours in quantity suitable for the age and size of the patient. The following day barley-water No. 1 is given, to which sugar is added to make the mixture 5 per cent.

Cow's Milk.—While it is doubtful if the child can take cow's milk after this period of stomach-rest and stomach-washing, it may be attempted. Two drams of as safe milk as can be obtained is added to every second feeding of the barley and sugar water. If it agrees, after a day or two, two drams are added to each feeding, with a gradual increase of a dram every two or three days. The intervals of feeding, for children under one year of age, may range from two to three hours. It is rarely advisable to feed even the most delicate athreptic oftener than once in two hours. If the milk can be retained and assimilated in the strength of one-fourth milk and three-fourths barley with 5 per cent. sugar, or if an equal quantity of milk and sugar-water alone is found to agree, the child will begin to grow and general improvement will rapidly follow. If the cow's milk is not well borne, skimmed milk or a weak cream mixture—one-half dram of cream to a feeding—may be tried. It is practically impossible to have whey made properly outside of a hospital laboratory or an intelligent home. In using whey it may be given in quantities suitable to the age of the patient. The prescribing of cream among the poor is a hazardous procedure, for the cream may be old, improperly cared for, and swarming with bacteria. If there is a tendency to looseness of the bowels, the diarrhea is thus made worse. Cream mixtures rarely succeed as foods for athreptic children. I use cream only among those who can properly care for it.

The Peerless Brand (Borden) (p. 114), evaporated and unsweetened, may, however, often be used with success.

Sweetened Condensed Milk.—I have found that for the out-patient athreptic the much-abused condensed milk fulfils a useful function. It is the cleanest food we can give the dispensary baby. It is the cheapest, the most easily kept, and the most easily digested milk that can be furnished him. Consequently, when ordinary milk feeding is impracticable or when it disagrees, I give condensed milk, beginning with one-half dram, which is added to the barley-water or to the plain water for every second feeding, later to every feeding, increasing the quantity gradually as the child shows an ability to digest it. The patient must be seen frequently and the stools carefully examined in order that an increase in the food strength may be made as soon as conditions allow. The mother is told to bring the napkins to the dispensary, and the child is weighed at each visit, every second day. It is most gratifying to see how well some of them gain in weight, not because they are getting an ideal food by any means, but because the food used temporarily fits the case. Condensed milk is thus used as a stepping-stone to something better. When the child has taken condensed milk with benefit for a month or six weeks, ordinary milk is attempted if the time of the year is between October and the following June. After June 1st I continue with condensed milk, as the possibility of some degree of anemia and rachitis as the cooler months approach is to be preferred to the risk of attempting cow's-milk feeding, with poor milk, in the hands of overworked or ignorant mothers.

In beginning ordinary milk, in order to avoid sudden radical changes I replace one feeding of the condensed-milk mixture daily with one feeding of a weak plain milk mixture. In some cases this will produce illness and must be stopped; in others, it will be well borne. When it is found to agree, two feedings should replace two condensed-milk feedings daily. In this way, by increasing by one the number of plain-milk feedings every third or fourth day, entire plain-milk feeding may safely be inaugurated. The strength of the plain milk should not, of course, correspond to that suggested for well babies. To a child of six months a three-months' formula may be given. As the child improves, the strength of the milk may correspondingly be increased. In this way I have treated successfully a great many tenement athreptics.

Some children will be able to take and properly care for only two plain-milk feedings daily; others will take every second feeding of plain milk. I have a patient at the present time, aged fourteen months. He will take two plain-milk feedings daily with comfort, but when the third is given he is invariably made ill. Some will not be able to take a particle of ordinary milk. When this is the case, the condensed milk should be combined with a gruel, such as oatmeal, which contains a high percentage of proteid. These cases may also be given beef-juice at a very early age. I often use pure cod-liver oil, from 15 to 30 drops of which may usually be taken three times daily without disturbance. The tenement athreptic is given the benefit of as much fresh air as

possible. He is also given the advantage of the daily tub-bath and the oil rub.

HABITUAL LOSS OF APPETITE

The growing child, like the adult, not only requires sufficient nourishment to sustain life, but, in addition to this, an extra amount to supply the demands of growth. Proportionate to their size, therefore, all growing animals require more food than do those that have reached maturity. The young child is naturally such a very hungry animal that ample feeding is absolutely essential. Therefore, when there is habitual loss of appetite so that the child's entire life may be unfavorably influenced, we must realize that the condition is abnormal and strive to discover the cause and apply the remedy.

Physicians are often consulted by parents whose children are suffering temporarily or persistently from loss of appetite—a condition usually associated with secondary anemia and asthenia. The child apparently is not ill: he may be active and playful, but he tires easily. The sleep ordinarily is sound and refreshing, but the child must be coaxed to eat. Oftentimes he will take food only when his attention is diverted by a story or a toy. He usually eats for the entire family, taking a mouthful each for father and mother, for the coachman, and for the cook! Three or four times a day, depending upon the number of meals, this coaxing, entertaining process has to be gone through with. Occasionally children with habitually poor appetites for food in general will have a history of excessive milk-drinking. From 3 to 5 glasses of milk may be taken daily and all other food refused. When milk forms the principal or only article of nourishment after the eighteenth month, children will invariably show evidences of malnutrition. They are apt to be pale and sallow, with flabby muscles. The most frequent cause of loss or lack of appetite is too frequent feeding. It is not at all uncommon to see children from two to four years of age who are being fed six or seven times in twenty-four hours, the argument of the parents being that: "The child takes so little food, he ought to take it oftener." With increasing age, more and stronger food is required at less frequent intervals. In other cases children may not get their regular feedings at such frequent intervals, but are generously supplied between meals with candy, cake, crackers, and fruits. Unsuitable food may be the cause of a habitually poor appetite. Children of tender age who are regularly fed from the adult table with heavy adult food, oftentimes improperly cooked, soon suffer from loss of appetite. Children who are poor eaters usually have the associated ailment, constipation. Too close confinement indoors is not infrequently associated with, if not a direct cause of, lack of appetite. Children who are kept uninterruptedly in the house for weeks at a time invariably have poor appetites.

Treatment.—In order to emphasize a point in teaching, when treatment is under consideration, I have sometimes found it useful to state, first, what *not* to do. Do not give these children drugs as a means of

inducing an appetite until all other means have failed. The only medication that should be permitted is some simple laxative. There must be one evacuation of the bowels daily. The aromatic fluidextract of cascara sagrada, from 1 to 2 drams, given daily at bedtime, or from 3 to 5 ounces of the citrate of magnesia given before breakfast, ordinarily answers well.

Fresh Air.—Every "runabout" child should spend at least five hours daily in the open air, regardless of the season of the year. During very inclement weather in winter indoor airing (see p. 732) is a most satisfactory substitute.

Diet.—An important step in the treatment is the regulation of the feeding hours. A child from twelve to fifteen months old requires five feedings daily (see Dietary, p. 97). Ordinarily, for "runabout" children from the fifteenth to the twenty-fourth month, four meals daily are necessary, but when there is loss of appetite, three meals often answer best. After the second year, three meals are invariably the rule unless the child is weak or ill. All feedings should be given at a definite time each day, from which there should be no deviation. Nothing whatever except water should be allowed between meals. My next step, in case these regulations fail, is to place the child temporarily on a markedly reduced diet, no solid food, such as meat, eggs, breadstuffs, vegetables, or fruits, being allowed. Milk, gruels, and broths should comprise the nourishment. The mother must be given the directions both orally and in writing.

If the case is one of milk habit, then the milk must be entirely cut off, and broth, thin gruel, dry bread, or zwieback substituted. The mother is instructed to return with the child in two days. In the great majority of instances the report after forty-eight hours is that the child is ravenously hungry. When such is the case freer feeding is allowed, but under the same strict observance of feeding intervals, with absolutely no feeding between meals. It is extremely rare to meet a case of habitual loss of appetite which will not respond to this simple method of treatment. In a large number of cases of failing appetite I have succeeded in restoring the desire for food by removing milk largely from the diet, having it skimmed and given in small amounts, morning and evening, and in reducing the sugar intake to a minimum. Many children get more milk than is good for them, and practically all children get more sugar than they can utilize with benefit.

Change of Climate.—Occasionally a child is brought for treatment who fails to show the least evidence of disease and yet will not respond to proper dietetic and hygienic measures. For such, a change of climate in addition to proper methods of feeding has been found advisable. A change from the city to the country, or from the inland country to the seashore, has been followed by a decided improvement. When such changes are impossible, or when proper dietetic regulations are impracticable, as with our dispensary patients, medication may be of service.

Tonics.—In my experience the best medicinal means of improving

the appetite is a solution of citrate of iron and quinin in sherry wine, 1 grain of the citrate of iron and quinin being dissolved in ½ dram of sherry wine and given, well diluted, before meals. This dosage will answer for children over eighteen months of age. For younger children, ½ grain of the citrate of iron and quinin in ½ dram of sherry wine, well diluted, may be given. If this is not successful, 1 minim of dilute hydrochloric acid, ½ minim of the tincture of nux vomica, and 2 teaspoonfuls of water may be given at two-hour intervals to children over fifteen months and under two years of age. After the second year 2 minims of the dilute hydrochloric acid and 1 minim of nux vomica, in 3 teaspoonfuls of water, may be given at two-hour intervals.

There remain also to be considered under this head not a few children who habitually suffer from poor appetite and are below the average in every respect. This type of child is considered in detail under The Care of the Delicate Child (p. 133).

MALNUTRITION IN INFANTS

I am often asked by students the difference between malnutrition and marasmus in infants. While hard-and-fast lines cannot be drawn to indicate where malnutrition ends and marasmus begins, there is a vast difference between the two conditions.

Etiology.—Malnutrition may best be described as the first stage of marasmus. Every child with marasmus must first have undergone a longer or shorter period of malnutrition. Victims through inheritance, such as those who are constitutionally rheumatic, the offspring of the tuberculous, and the remotely syphilitic, often show signs of malnutrition. They are inherently weak, and possess low vital resistance. Frequent child-bearing may be a predisposing factor—the fourth or fifth child, when the pregnancies have been close together, may show general lack of vigor.

Symptoms.—With malnutrition the infant may be three or four pounds under weight, his gain being slow and irregular; often inappreciable, or, at best, a few ounces a week. The muscles are soft, and if the condition persists, bone changes, indicating rachitis, soon appear. The child is pale and usually thin. There is a secondary anemia. Dentition is delayed. The hands and feet are apt to be cold, and the skin is dry. Excoriations of the buttocks and intertrigo are of common occurrence. The patient shows evidence of indigestion by a distended abdomen and stools that are far from the normal. There may, however, be no intestinal derangement whatever, the malnutrition being due to the fact that the child's diet for months has consisted of food that did not contain the nutritional elements required, or the fact that he was unable to utilize that which had been given him.

A case due to high fat feeding was recently seen by me. The patient was a male, six months of age, weighing 13 pounds, a resident of a New York suburb, where the conditions are most healthful. His fontanel was slightly depressed, the muscles were soft and flabby, and the ribs were beaded. The child had lost his appetite and suffered from con-

stipation. A history of the feeding showed that he had been getting a cow's-milk mixture containing approximately 6 per cent. fat, 4 per cent. sugar, and 2 per cent. proteid. In this patient the indigestion, loss of appetite, and constipation were unquestionably due to the high percentage of fat. The energy exerted in digesting the food almost counterbalanced the benefit derived from it, the result being a very slow gain in weight.

Diagnosis.—Upon assuming the care of one of these infants, one must invariably make a very thorough examination in order to determine whether there are other factors than that of imperfect gastro-intestinal function. Following the usual physical examination, which should include the ears, the urine should be examined; there should be a von Pirquet test for possible tuberculosis; there should be a blood count to learn the degree of anemia and the possibilities of occult pus, and if the case is very persistent, a blood culture should be made, as it not infrequently occurs that a hitherto unsuspected cause of malnutrition may be bacteremia. In my hospital cases the pneumococcus, the streptococcus, and the staphylococcus have been found in the blood in malnutrition babies.

Treatment.—*Diet.*—The management of malnutrition due to such causes consists in correcting the digestive errors, in using castor oil or calomel with stomach-washing, and in adjusting the food to the child's requirements and digestive capacity.

The suggestions in diet are to be found under Marasmus, p. 81.

Difficult Feeding Cases.—A mistake frequently made in the feeding of these cases is to give the food at too frequent intervals. At the sixth month three-hour feedings, six in twenty-four hours, are best, even though the food is weak. The stomach will bear stronger food given at longer intervals sooner than such food given at intervals of two and one-half hours. When the child is nine or ten months of age, four-hour intervals usually answer best. For infants who are under weight and delicate it may be necessary to continue with the three-hour feedings after the sixth month. Cow's milk should be the basis of the diet, given according to the suggestion in the section on Marasmus. In many cases cereal gruels made from barley or oatmeal may with advantage be added. Malt soup (p. 113) may often be used with success for these patients. A milk formula below that indicated by the child's age may have to be given for a long time. Thus, when six months of age he may be able to take but a three-months' formula; when nine months of age, a six-months' formula. I have constantly under my care infants who cannot take cow's-milk mixtures corresponding in strength to that usually taken by well infants of the same age.

Hygiene.—Attention to the matter of outdoor life, indoor airing on inclement days, and residence in the country during the heated term are of great importance in the general management. During the cooler months the child should receive inunctions of unsalted lard or goose oil after the daily evening bath. Constipation, if present, is treated by the oil-injection method (see p. 242), or olive oil may be given by the mouth,

1 to 2 drams after two or more feedings daily. Besides being of decided benefit in relieving the constipation, the oil adds not a little to the nutrition of the patient.

TARDY MALNUTRITION AND MALNUTRITION IN OLDER CHILDREN

Malnutrition, with tuberculosis and syphilis, is not a part of our subject. In the sections on Malnutrition in Infants and Children it may be thought that there is repetition of what is said under the title of the Delicate Child. While the management necessarily is along the same lines, two distinct types of children are represented. The marasmic and malnutrition infant or young child may be but temporarily delicate. When the child with simple malnutrition recovers, he may develop into as normal a specimen of robust childhood as could be desired. The delicate child as I have endeavored to describe him is inherently delicate, and our efforts are toward improving his condition, with the hope, perhaps, but with no great assurance, that he will some time become a robust adult.

Tardy malnutrition is usually seen in children of the school-age, although it may appear any time after the third year. They are deficient in weight, in resistance to disease, and in capacity for work; they are pale, thin, tired children.

Etiology.—Cases of tardy malnutrition as well as those of marasmus and infantile malnutrition are seen in all the walks of life, among the wealthy, the so-called middle class, and among the poor. Strange as it may seem, these cases, regardless of the station of life, have two causes, common to all, waste of energy and defective feeding. The scion of wealth who is overfed or badly fed—given food which is unsuitable, and allowed the promiscuous use of sweets—may develop malnutrition just as effectively as the child of the tenement who subsists on fried meats, grocery milk, boxed breakfast foods, and poorly cooked vegetables.

The most important factors in these cases are overwork—excessive energy output, in school, at work, or at play—and inadequate rest. The child is active from early morning until bedtime at 7 or 8 o'clock. This entails waste of vitality and the organism suffers. Every child until the seventh year should have an after-dinner rest, sleep if possible, for one to one and one-half hours.

In all cases errors in the daily life of the patient will be most apparent.

There is a painful lack of knowledge among all classes as regards the nourishment required by a growing child. He is fed to satisfy his appetite, and when this is accomplished, the parents believe that their duty is done. How far they fall short of proper feeding is demonstrated daily in out-patient clinics and in private work. Poverty is an occasional cause of bad feeding in New York city.

Treatment.—I have repeatedly seen children from five to ten years of age, with marked malnutrition, gain from 3 to 5 pounds the first month under treatment which consisted simply in inaugurating the midday rest and in giving food that they had a right to demand, properly

prepared at definite intervals. The school-child suffering from malnutrition should be removed from school temporarily, and as much outdoor life as possible should be enjoyed by him, regardless of his station in life. Everything of a strenuous nature should be avoided. He should be put to bed early and encouraged to sleep late. A midday rest for one who shows marked emaciation and diminished resistance is advised.

Illustrative Cases.—The following is quite a usual history of an advanced case of malnutrition in a girl, seven years of age, and the treatment is that which we usually employ: The mother brought the girl to the out-patient service at the New York Polyclinic because the child was pale, did not grow, and was always tired—too tired to go to school, of which she was very fond; too tired to play with other children, as had previously been her custom. Her weight was 41 pounds. There was loss of appetite, no food being taken except on compulsion. There was no evidence of congenital syphilis or tuberculosis. There was a secondary anemia. The child slept in a badly ventilated room; she drank tea and coffee. Cake, pastry, and sweets were her regular diet, and because she did not eat at meal-times she was allowed to eat between meals whenever and whatever she pleased. The following mode of life and diet was prescribed: She was to sleep in the front room, known as a sitting-room or parlor, with a window open at least six inches. She was given three meals a day with nothing whatever between meals. The diet consisted of red meat once a day, two or three soft-boiled eggs daily, one quart of good milk daily if it agreed (and it did agree). She was to have only natural cereals, such as oatmeal, cracked wheat, and cornmeal—each of which was to be cooked three hours the day before it was to be given. Baked or boiled potatoes and one green vegetable were to form a part of the dinner at midday. Stewed and raw fruits and plain puddings with home-made bread and plenty of butter completed the dietary. She was put to bed at 7 o'clock and arose at 7 the following morning. An after-dinner rest in a darkened room for an hour was insisted upon. Before retiring she was given a brine bath (p. 750), followed by a brisk drying with a rough towel, after which her entire body was rubbed for ten minutes with olive oil. In one month a radical change had taken place. She had gained 4 pounds in weight. Her color was good. She complained no more of languor or fatigue. She was eager for school. The improvement continued, and in ten weeks she made a perfect recovery. In not every case will results be so prompt and satisfactory. In some, a longer time will be required before pronounced results are to be seen. Every child suffering from malnutrition of this type cannot help being benefited more or less by such a régime.

A most pronounced case of this type was in a boy, eight years of age, who presented a most dilapidated picture. He was tall for his age, very thin, pale, habitually tired, and had a well-developed habit-spasm. He was restless, active, and played hard when he was not too tired to play. His weight was 59¼ pounds.

The living régime prescribed was as follows: He breakfasted at 7.30 A. M. He was to remain in bed until 10 o'clock in the morning, then up and about at play as he wished. Dinner at 12.30 was followed by a rest of one and one-half hours. Play was permitted without particular restraint until supper at 6.30. Bedtime was 7.30 P. M. He improved rapidly and in one month was permitted to arise with the family. From October 12th to May 27th he gained in weight 19¼ pounds.

I have treated a great many of these cases of malnutrition in older children in the same manner, by limiting the energy output, and right feeding. A gain of from 2 to 6 pounds a month for the first month or two is the usual result of the treatment. At the same time there is a radical change in the child's mental attitude and general appearance.

Tonics.—The tincture of nux vomica, 4 drops in water before meals, is sometimes given to children whose appetite is defective. One grain of the citrate of iron and quinin in 1 dram of equal parts of sherry wine and water may be substituted. If there are a secondary anemia and a defective nerve resistance, the following prescription is given, interrupted by five days free from medication:

For a child five to ten years of age:

℞ Liq. potassii arsenitis ..... ♏lxiv
Liq. ferri albuminati ..... ℥iv
Syr. hypophosphitum (calcis et sodæ) ..... ℥iij
Aquæ ..... q. s. ad ℥vj
M. ft. Sig.—One teaspoonful after meals in water.

During the five days without the medication cod-liver oil may be given.

Constipation.—If constipation is present, the oil-injection treatment (p. 242) may be instituted, or olive oil may be given internally, 2 or 3 drams after meals. If the oil is not well taken, or if it disagrees in any way, its use should be discontinued. Liquid albolene (aromatic), in ½ to 1 ounce dosage at bedtime, answers well in many. The dosage may be gradually reduced and later discontinued.

Feeding After the First Year

General Properties of Foods

Substances used as foods, regardless of the animal which they may nourish, possess the common property of being composed of fat, proteids, carbohydrates, mineral substances, and water, in varying proportions. The purposes that these serve in the animal economy are essentially the same in all forms of animal life. In order to determine the food-value of any substance, a chemical analysis which shows the quantities of these nutritional elements is required. It will be found that foods varying widely in appearance and physical properties are still similar in that they are composed of the same food elements, although in different proportions.

Foods used to sustain animal life in any form must contain the ingredients needed, and these must be present in a form suited to the particular kind of animal to be fed, whether it is man or one of the lower animals.

The Ingredients of Foods.—In the individual foods the nutritional elements exist in widely differing forms. Fat may be supplied in meat, cream or milk, butter, oleomargarin or butterine, lard, olive oil, cod-liver oil, linseed oil, cottonseed oil, etc. Carbohydrates may be furnished in the form of cane-sugar, milk-sugar, maltose, and dextrose—soluble products derived from starch, corn-starch, wheat or other flour, oatmeal, rice, hominy, bread, potatoes, etc. Proteids are secured in the form of lean beef, lamb, or pork, chicken, fish, the gluten of such cereals as wheat and oats, and also in large quantities from peas, beans, lentils, and other legumes, from the curd of milk, and from eggs. The mineral substances of food are found combined with the other ingredients in the form of lime, phosphates, magnesium, etc.

The Function of the Food Elements.—The proteids of the food are used to form the bodily structures and to replace tissue consumed by the vital processes and excreted as urea. The vital processes, such as the circulation of the blood, respiration, and contractions of the

muscles, call for energy, and this, together with bodily heat, must be supplied by the fats and carbohydrates. The mineral substances are used in the formation of bone and teeth, while the water serves to dissolve the food elements after they have been digested and to carry off waste products.

The Advantage of a Knowledge of the Composition of Foods.—Inasmuch as each food element has a special function to perform, and since growth is impossible without a sufficient supply of these nutritional elements, particularly the proteid, it is essential to know within reasonable limits the composition of a food, because if the elements are not present in proper proportions, disappointing results may be obtained from their use, which will appear inexplicable, but which will readily be accounted for if we know what element of the food is at fault. For these reasons it is coming to be the practice, in infant-feeding especially, to speak of the percentage composition of the milk-foods as, for example, a food containing 4 per cent. fat, 7 per cent. carbohydrates, 2 per cent. proteids, and 35 per cent. mineral substances. Knowing from wide experience the percentages of these ingredients generally needed in a food if it is properly to nourish a child, the physician can determine in an instant whether an infant is having a food of suitable nutritive value, by comparing its known composition with that established, by experiment, as requisite.

The Selection of Food.—In a review of analyses of foods many substances will be noticed which, according to their chemical composition, have the same food-value, but which common sense tells us are not interchangeable. For instance, no one would attempt to feed to a human being cracked oats unless thoroughly cooked, but he would give them raw to the lower animals. They will nourish a man or the animal equally well, but for man they must be prepared, while the horse, for example, can utilize them in their original state. This illustrates the importance of *adapting food* to the consumer. Often the question in feeding is not so much, Is the food nutritious? as, Can the patient assimilate it? Oftentimes success in infant-feeding lies in the physician's ability to discover a form of fat, carbohydrate, and proteid which the infant can assimilate. In the following pages feeding measures for temporary use will be found which may not conform to what some may consider strictly scientific principles; yet they often give brilliant results. Looking a little below the surface, it will be found that the measures suggested are not unscientific, and that the results are due to applying the fixed principles of nutrition in perhaps novel or unusual ways. It is usually best to follow the most direct route to any place, but when this is badly blocked it is better to go another way, if there is one, rather than not to arrive at one's destination.

General Properties of Milks.—When most young animals are born, their digestive organs are in a more or less embryonic condition, and it is several months before they entirely outgrow this state. During this period the nourishment is supplied by the mother through her mammary glands, first as colostrum and later as milk. When these secre-

tions are analyzed they are found to consist of fat, carbohydrates, proteids, mineral substances, and water, and in this respect they do not differ from other foods. But the elements exist in the secretion in peculiar forms, and the natural inference is that in some way they must be particularly suited to animals whose digestive organs are still undeveloped.

The digestive secretions of the stomachs of all known animals contain pepsin and hydrochloric acid. In the very young these secretions are feeble, but as development proceeds they are much more abundant. To understand milk as a food one must know the effect upon it of pepsin and acid. When pepsin is added to tepid cow's milk it causes the milk to gelatinize, with the formation of curd or junket. If the milk is slightly acidified or soured, the curd formed is dense and solid and more difficult of digestion. When the milk of the cow or the ass or human milk is treated with pepsin and acid in exactly the same way, curds totally different are formed, and as the human digestive organs are different from those of the cow or the ass, it is believed that these differences in the digestive properties of milks are for the purposes of making the milks suitable for the different kinds of digestive tracts. Milks may be regarded as special forms of food which require greater digestive effort as the digestive secretions of the stomach become stronger, and thus solid food is furnished to the developing stomach. It is that portion of the proteid of the milk called "casein" that is changed into a solid by the pepsin of the stomach. The term casein, however, has been loosely applied to all the proteids of all milks. The caseins of all milks are not alike in their digestive properties. Therefore, the mistake of so considering them should be guarded against. A consideration of such a modification and adaptation of cow's milk as will make it acceptable to the infant's digestive possibilities will be found in the chapters dealing with Substitute Feeding.

DIET FROM THE FIRST TO THE SIXTH YEAR

At the completion of the twelfth month the average well-regulated baby should be weaned and given other nourishment. If bottle-fed, he should receive more than the milk and cereals, with which most children are fed. The food suitable for the second year of life and the method of its preparation and administration are subjects concerning which the masses are most profoundly ignorant. A few children at this period of life are underfed, but the great majority are overfed and carelessly given, at improper intervals, unsuitable food, indifferently prepared. Summer diarrhea finds its greatest number of victims among those children over twelve months of age who have been carelessly fed.

The Second Summer.—The dreaded "second summer" robs many homes because of ignorant or careless parents. The second summer, approached properly, is hardly more dangerous than any other summer during the early years of a child's life. It is almost a universal custom, when the child is weaned or given something other than a milk diet, to allow him "tastes" from the table. Very often these tastes comprise

the entire dietary of the adult. Milk is oftentimes the only suitable article of diet that is given. Eventually, not only is the other food selected unsuitable, but it is given irregularly, and supplemented by crackers kept on hand for use between meals. During the hot months the gastro-intestinal tract is less able to bear such abuse and the child becomes ill.

Feeding After the First Year.—Usually when the twelfth month is completed I give the mother a diet schedule, with instructions to begin gradually with the articles allowed, in order to test the child's ability to digest them. Every new article of food should be carefully prepared and given at first in very small quantities. All meals are to be given regularly, with nothing between meals. With many children this expansion of the diet-list is attended with considerable difficulty. They are thoroughly satisfied with milk, and refuse all other forms of nourishment. In such cases time and patience are necessary at the feeding-time. The more solid articles of diet should be given first and the milk kept in the background.

Among the underfed seen at this period of life are those who were nursed too long or those who were kept too long upon an exclusive milk diet. A great majority of the cases of malnutrition of the second year are seen in the exclusively milk fed. These children are pale, soft, flabby, and badly nourished.

The following is a diet schedule which I have employed for several years. Each mother is instructed to select, from the foods allowed, a suitable meal:

From the twelfth to the fifteenth month; five meals daily:

7 A. M.: Oatmeal, barley or wheat jelly, one to two tablespoonfuls in 8 ounces of milk. (The jelly is made by cooking the cereal for three hours the day before it is wanted and straining through a colander.) Stale bread and butter or zwieback and butter.

9 A. M.: The juice of one orange.

11 A. M.: Scraped rare beef, one to three teaspoonfuls, mixed with an equal quantity of bread and moistened with beef-juice. Or a soft-boiled egg mixed with stale bread-crumbs; a piece of zwieback and a half-pint of milk.

(Scraped beef is best obtained from round steak, cut thick and broiled over a brisk fire sufficiently to sear the outside. The steak is then split with a sharp knife and the pulp scraped from the fiber.)

3 P. M.: Beef, chicken, or mutton broth, with rice or stale bread broken into the broth. Six ounces of milk, if wanted. Stale bread and butter or zwieback and butter. Many children at the above age will take and digest apple-sauce and prune pulp; when these are given milk should be omitted.

6 P. M.: Two tablespoonfuls of cereal jelly in 8 ounces of milk; a piece of zwieback. Stale bread and butter or Huntley and Palmer breakfast biscuit.

10 P. M.: A tablespoonful of cereal jelly in 8 ounces of milk.

From the fifteenth to the eighteenth month; four meals daily:

7 A. M.: Oatmeal, hominy, cornmeal, each cooked three hours the day before they are used. When the cooking is completed, the cereal should be of the consistence of a thin paste. This is strained through a colander, which upon cooling will form a mass of jelly-like consistence. Of this give two or three tablespoonfuls, served with milk and sugar, or butter and sugar, or butter and salt. Eight to 10 ounces of milk as a drink. Zwieback or toast.

9 A. M.: The juice of one orange.

11 A. M.: A soft-boiled egg mixed with stale bread-crumbs, or one tablespoonful of scraped beef (p. 104), mixed with stale bread-crumbs and moistened with beef-juice. A drink of milk. Zwieback or bran biscuit, or stale bread and butter.

3 P. M.: Mutton, chicken, or beef broth, with rice or with stale bread broken in the broth. Custard, corn-starch, plain rice pudding, junket, stewed prunes, baked apple, or apple-sauce.

6 P. M.: Farina, cream of wheat, wheatena (cooked two hours). Give from one to three tablespoonfuls, served with milk and sugar, or butter and sugar, or salt and butter. Drink of milk. Zwieback or stale bread and butter.

From the eighteenth to the twenty-fourth month; four meals daily:

7 A. M.: Cornmeal, oatmeal, hominy (prepared as in the above schedule). Serve with butter and sugar, or milk and sugar, or butter and salt. A soft-boiled egg every two or three days. Hashed chicken on toast occasionally. A drink of milk. Bran biscuit and butter or stale bread and butter.

9 A. M.: The juice of one orange.

11 A. M.: Rare beef, minced or scraped; the heart of a lamb chop, finely cut. Chicken. Spinach, asparagus tips, squash, strained stewed tomatoes, stewed carrots, mashed cauliflower. Baked apple or apple-sauce. Stale bread and butter.

After the twenty-first month baked potatoes and well-cooked string-beans may be given.

3 P. M.: Chicken, beef, or mutton broth, with rice or with stale bread broken into the broth. Custard, corn-starch, or plain rice pudding, junket, stewed prunes. Bran biscuit and butter or stale bread and butter.

6 P. M.: Farina, cream of wheat, wheatena (each cooked two hours). Give from one to three tablespoonfuls, served with milk and sugar, or butter and sugar, or butter and salt. Drink of milk. Zwieback or stale bread and butter.

After the eighteenth month a large number of children will have a better appetite and thrive more satisfactorily on three full meals a day. The breakfast is advised at 7.30 A. M. and the dinner at 12 o'clock. At 3 P. M. or 3.30 P. M. a cup of broth and a cracker or toast and a drink of milk may be given.

From the second to the third year; three meals daily:

Breakfast: 7 to 8 o'clock. Oatmeal, hominy, cracked wheat (each cooked three hours the day before they are used), served with milk and sugar or butter and sugar. A soft-boiled egg, hashed chicken. Stale bread and butter. Bran biscuit and butter. A drink of milk.

At 10 o'clock the juice of one orange may be given.

Dinner: 12 o'clock. Strained soups and broths, rare beefsteak, rare roast beef, poultry, fish. Baked potato, peas, string-beans, squash, mashed cauliflower, mashed peas, strained stewed tomatoes, stewed carrots, spinach, asparagus tips. Bread and butter. For dessert: plain rice pudding, plain bread pudding, stewed prunes, baked or stewed apple, junket, custard, or corn-starch.

Supper: 5.30 to 6 o'clock. Farina, cream of wheat, wheatena (each cooked two hours). Give from one to three tablespoonfuls served with milk and sugar, or butter and sugar, or butter and salt. Drink of milk. Zwieback or stale bread and butter. Twice a week custard, corn-starch, or junket may be given, or a tablespoonful of plain vanilla ice-cream.

As a rule, three meals answer best at this period. With three meals a child has a better appetite and much better digestion, and consequently thrives far better than one whose stomach is kept constantly at work. Some children, however, will require a luncheon at 3 or 3.30 P. M., and will not do well without it. This is apt to be the case with delicate children, particularly those under two and one-half years of age. If food is necessary at this hour, a glass of milk and a Graham biscuit or a cup of broth and zwieback will answer every purpose. Instead of the afternoon meal, the child may relish a scraped raw apple or a pear. Fruit at this time is particularly to be advised if there is constipation. Children recovering from serious illness will require more frequent feeding.

From the third to the sixth year:

Breakfast: Cracked wheat, cornmeal, hominy, oatmeal (each cooked three hours the day before they are used). These may be served with milk and sugar, or butter and sugar, or butter and salt. A soft-boiled egg, omelet, scrambled egg. Bread and butter, bran biscuit and butter. A glass of milk.

Dinner: Plain soups, rare roast beef, beefsteak, poultry, fish, potatoes stewed with milk or baked. Peas, string-beans, strained stewed tomatoes, stewed carrots, squash, boiled onions, mashed cauliflower, spinach, asparagus tips, bread and butter. *For dessert:* Rice pudding, plain bread pudding, custard, tapioca pudding, stewed prunes, stewed apples, baked apples, raw apples, pears, and cherries.

Supper: Farina, cream of wheat, wheatena (each cooked two hours). Give from two to three tablespoonfuls, served with milk and sugar, or butter and sugar, or butter and salt. Zwieback or stale bread and butter. Bread and milk. Milk-toast. Scrambled eggs twice a week.

Custard or corn-starch each once a week; ice-cream once a week. Bread and butter. A glass of milk.

When the child has eggs for breakfast, they should not be repeated in any form for supper. Red meat should be given but three times a week. When the child has a chop for breakfast, he should have poultry or fish for dinner. At this age of great activity and rapid growth the child will often demand food between dinner and supper. Carefully selected fruit, such as an apple, a pear, or a peach, may be given at this time, supplemented by a Graham cracker or two, or by stale bread and butter, if it is found that their use does not interfere with the evening meal.

DIET AFTER THE SIXTH YEAR

When the normal child has passed the sixth year the diet may be considerably expanded, approximating to that of the adult in variety; certain restrictions, however, are to be borne in mind. Fried foods should not be given; highly seasoned dishes, such as pie, rich puddings, gravies, and sauces, are to be avoided. Salads with plain dressing may now be given. Wine and beer, coffee, and tea should never be given to children as a beverage. A point to be kept in mind in feeding children of this age, as well as those who are younger, is the proper cooking of vegetables. Everything in the line of green vegetables should be cooked until it can readily be mashed with a fork.

DIET DURING ILLNESS

The digestive capacity of every child is diminished during illness, the extent depending largely upon the age of the child and the severity of the disease. The younger the child, the greater the incapacity. This is fairly constant with all the ailments of childhood, including, of course, those which directly affect the gastro-enteric tract.

Reduction in Food Strength.—In a moderately severe bronchitis, with a degree or two of fever, the digestive capacity is slightly diminished and a 25 per cent. reduction in the strength of the food will answer. During the critical stage of a lobar pneumonia the digestive powers are held in abeyance and predigested foods and alcohol must sustain the patient. During an attack of measles, scarlet fever, bronchopneumonia, or diphtheria in bottle-fed infants, at the height of the disease, it is my custom to reduce the strength of the food one-half by the addition of water, to make up for the quantity removed. For ailments of lesser severity, such as bronchitis, with a temperature of 100° to 101° F., or chicken-pox, or mild measles, I reduce the strength of the food from one-fourth to one-third. In the event of any mild ailment or injury which confines a child to his bed, the food strength should be cut down, for inactivity as well as disease lessens the digestive capacity.

Among nurslings and the bottle-fed these precautions are particularly necessary. A child with fever is apt to be thirsty and to take more fluid than in health. This is frequently the case during summer

diarrhea. In order to prevent taking too much food, I not only order that the milk be diluted for the bottle-fed, but I instruct the mothers of nurslings to give a drink of water immediately before each nursing and between nursings, and then to allow the child to nurse only one-half or two-thirds the usual time. For the bottle-fed, one-half to one-third the contents of each bottle is removed and the quantity replaced by boiled water, so that the amount of fluid given remains the same.

If a child is a "runabout," over two years of age, he is given broths and thin gruel—one-half milk and one-half gruel. By carefully watching the stools, thus fitting the food to the child's capacity, we will avoid grave intestinal complications which, during the summer, often prove to be more serious than the original ailment. In the acute gastro-enteric troubles and in typhoid fever, all milk must be discontinued.

The dietetic management of the acute intestinal diseases and typhoid fever is referred to in detail under the respective headings.

The Art of Feeding in Illness.—Not only is food oftentimes taken in insufficient quantity in illness, but in many cases it is absolutely refused. In other cases, during coma and asthenic states, swallowing is impossible. In delirium and in conditions of collapse nourishment must be given, and when this is impossible by the natural method, we have, as temporary substitutes, gavage, oil inunctions, and rectal feeding—all referred to elsewhere.

Forcing the child to take nourishment by the mouth is rarely necessary. Coaxing and bribing ordinarily succeed far better. For a child from three to five years of age a bright new penny possesses much persuasive power. The child will usually take food better from one to whom he is accustomed, like the mother or nursery maid. The trained nurse should understand that while she is unacquainted with the patient, the simpler requirements of the child are to be looked after by others to whom the patient is accustomed.

The nourishment should be as palatable as possible and served in bowls, cups, or plates that are attractive to the patient, because of color, pictures, or peculiarities of shape. Junket, flavored with vanilla, served cold, is a favorite food for sick children of the "runabout" age. Frozen custard and home-made ice-cream, made with one-third cream and two-thirds milk, will usually be well taken. Toast, dry bread, and crackers made in peculiar shapes are attractive to the child. In not a few cases I have succeeded in feeding satisfactorily children two or three years old, when several other schemes had failed, by allowing the temporary return to the bottle, from which they had been weaned for a year or so.

In these difficult feeding cases the child's peculiarities and wishes must be studied. Children in illness require water. Oftentimes they take it in insufficient quantities. Those who refuse plain water will often take ginger ale, sarsaparilla, or vichy. In the event of these drinks being well taken, they may be given freely. In the acute infectious diseases, which include pneumonia, free water-drinking is a therapeutic measure of no mean value.

COMMON ERRORS IN FEEDING

In the care of the bottle-fed the most frequent error is *overfeeding*, or the use of a stronger mixture than the child is able to digest. Particularly is this apt to be the case at the commencement of bottle-feeding. The amount is usually too large and the intervals between the feedings are almost invariably too short. *Children of the same age cannot all be fed alike.* Artificially fed babies of equal health and vigor, but of considerably varied size and weight, will require food of approximately the same strength, and the same intervals between feedings; but the larger the child, the greater the quantity of food required. Thus, the quantity given at one feeding for a child weighing 13 pounds at the sixth month will not be sufficient for a child of the same age weighing 16 pounds.

The quantity of food for each feeding for an average baby weighing 15 pounds at six months is about 6 ounces, and this quantity should be diminished ½ ounce for every pound under this weight until the total quantity is reduced to 4 ounces; and for every pound over 15, ½ ounce should be added to each feeding until the total is increased to 9 ounces. The number of feedings in twenty-four hours should be the same for all young children of the same age. In the table of food formulas given on p. 103 only the average child of average weight is considered.

AGE OF CHILD, SIX MONTHS

Weight of Child	Quantity for Each Feeding
11 pounds	4 ounces
12 pounds	4½ ounces
13 pounds	5 ounces
14 pounds	5½ ounces
15 pounds	6 ounces
16 pounds	6½ ounces
17 pounds	7 ounces
18 pounds	7½ ounces
19 pounds	8 ounces
20 pounds	8½ ounces
21 pounds	9 ounces

Keeping the child on an exclusive milk diet until the twelve month or later is a not infrequent error. As a rule, starch in some form may be added to the food at the seventh month, and should always be added as early as the ninth month. The giving of food other than well-cooked cereals and milk before the twelfth month is a mistake made in many households, and a common error from the twelfth month to the third year is to allow the child's diet to consist largely of milk and insufficiently cooked cereals. Crackers and milk, bread and milk, cake, and fancy crackers, often constitute the only articles of diet during this very important period of growth. The fact that a high proteid food is as necessary for proper development now as at bottle age, is overlooked. During early infancy milk is invaluable, but it is not sufficient for the demands of older childhood. Milk, eggs, meat, and cereals, such as oatmeal, rich in proteid, are absolutely necessary to normal growth.

Irregularity in feeding is another frequent error. The child should have his meals "on the minute," at the same time every day. The lack of observance of this rule will surely result in loss of appetite and indigestion. Indiscriminate eating between meals of bread and butter, pastry, or confectionery, if persistently practised, will surely be followed by indigestion and malnutrition.

Forcing or coaxing a child to eat is a practice always to be avoided. If suitable food is given at definite well-ordered intervals, a normal child will be hungry at those intervals. If he does not eat, something is wrong, and it is our duty to discover the cause of his loss of appetite.

MILK FOR TRAVELING

In making long journeys with infants by land or water, the feeding of the child is an important matter, and advice is often sought by mothers who wish to make the contemplated trip with the least possible risk. It is, of course, desirable that no change be made in the milk commonly used, and there are means of treating the milk and of keeping it which enable us to assure the patient of reasonable safety. It is my custom with city children to have the milk prepared at the Walker-Gordon Laboratory, where at a trifling expense small ice-boxes can be obtained which contain sufficient space for a few days' supply of milk and which can be conveniently carried on cars and boats. Larger boxes with a capacity of 12 quarts may be used for an ocean voyage. The smaller box will need refilling with ice, which is usually readily secured once or twice a day. The larger box for ocean voyages is packed in ice and placed in a cold-storage room of the vessel and will not need repacking during the trip. The milk prepared for a journey should be cooled to 45° F. as soon as it is drawn, and kept at this temperature until it can be sterilized at a temperature of 212° F. for twenty minutes. It should then be cooled rapidly to at least 50° F. and kept at this point until used. These directions can be carried out by any intelligent family. When this is done, the milk will be safe for use for the time required—from seven to eight days. Of course, laboratory milk is available for comparatively few. But the suggestion as to the making of an ice-box can be followed in any town or village, so that a milk laboratory is not essential. All that is required is the ice-box, the quart fruit-jars or quart milk-bottles, and clean milk. Those who for any reason cannot avail themselves of the milk thus preserved will find in canned condensed milk a fairly good substitute. See Condensed Milk (p. 114).

FOOD FORMULAS

Beef-juice.—Take a round steak, cut into pieces the size of a horse-chestnut, place in a buttered pan in a hot oven, and bake for fifteen minutes; remove from the pan and press out the blood; add salt to the taste.

Beef, Mutton, and Chicken Broth.—Take one pound of meat free from fat, cook for three hours in one quart of water, adding water from time to time, so that when the cooking is completed there will be one quart of broth. When the broth is cool, remove the fat, strain, and add salt to the taste.

Scraped Beef.—Broil round steak slightly over a brisk fire. Split the steak and scrape out the pulp, using a dull knife.

Egg-water.—The white of one egg, thoroughly beaten in one pint of cold boiled water; strain; add salt to the taste.

Oatmeal Jelly.—Oatmeal, four ounces; water, one pint; boil for three hours in a double boiler, water being added, so that when the cooking is completed a thin paste will be formed. This while hot is forced through a colander to remove the coarser particles. When cold, a semi-solid mass will be formed.

Wheat Jelly and Barley Jelly.—Wheat jelly and barley jelly are made in the same way as oatmeal jelly, using cracked wheat or barley grains.

Barley-water No. 1.—Robinson's barley flour or Cereo Co.'s barley flour, one rounded tablespoonful; water, one pint. Boil thirty minutes; strain; add water to make one pint.

In making **barley-water No. 2** two tablespoonfuls of the flour are used, and for **No. 3** three tablespoonfuls are used.

Imperial Granum is used in strengths identical with barley.

Rice-water No. 1.—Rice, one tablespoonful; water, one pint; boil three hours, adding water from time to time, so that there is one pint of rice-water at the end of the three hours.

In making **rice-water No. 2** two tablespoonfuls of rice are used.

Percentage Gruel Flours.—There has recently been put on the market in tin boxes, the covers of which are used as measures, a series of flours, especially made for preparing cereal gruels and jellies of known percentage composition. On the labels are given only the cooking directions for preparing plain or dextrinized gruels, and their composition when different quantities of flour are used. They are as follows:

APPROXIMATE COMPOSITION OF GRUELS MADE FROM CEREO CO.'S GRUEL FLOURS

	Barley		Legume*		Oat		Wheat	
	Proteids	Carbohydrates	Proteids	Carbohydrates	Proteids	Carbohydrates	Proteids	Carbohydrates
	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent	Per cent
¼ ounce flour to quart of water	0.12	0.60	0.19	0.53	0.12	0.60	0.10	0.62
½ ounce flour to quart of water	0.24	1.20	0.39	1.06	0.24	1.20	0.20	1.25
¾ ounce flour to quart of water	0.36	1.80	0.58	1.59	0.36	1.80	0.30	1.88
1 ounce flour to quart of water	0.48	2.40	0.78	2.12	0.48	2.40	0.40	2.50
2 ounces flour to quart of water	0.96	4.80	1.56	4.24	0.96	4.80	0.80	5.00
3 ounces flour to quart of water	1.44	7.20	2.34	6.36	1.44	7.20	1.20	7.50
4 ounces flour to quart of water	1.99	9.60	3.12	8.40	1.92	9.60	1.60	10.00

* Made from equal parts of peas, beans, and lentils.

Dextrinized Barley-water.—Robinson's barley flour or Cereo barley flour, three tablespoonfuls; water, one pint; boil thirty minutes; add water to make a pint. When lukewarm (100° F.), add one teaspoonful of Cereo; strain; this changes the starch into dextrinized maltose.

Oatmeal-water No. 1.—Oatmeal, one tablespoonful; water, one pint; cook three hours and add water to make one pint.

In making **oatmeal-water No. 2** two tablespoonfuls of oatmeal are used.

Imperial Granum-water No. 1.—Imperial Granum, one tablespoonful; water, one pint; cook thirty minutes and add hot water to make one pint.

In making **Granum-water No. 2** two tablespoonfuls of Granum are used.

Whey.—Put one pint of fresh milk into a saucepan and heat it lukewarm—not over 100° F.; then add two teaspoonfuls of Fairchild's essence of pepsin and stir just enough to mix. Let it stand until firmly jellied, then beat with a fork until it is finely divided; strain, and the whey, the liquid part, is ready for use.

Junket.—To one pint of fresh milk add two teaspoonfuls of sugar and one junket tablet or two teaspoonfuls of essence of pepsin. Allow it to stand over a fire until the temperature is 100° F.; then add vanilla as a flavoring and allow it to stand until the curd is set, when it should be placed on ice.

THE PROPRIETARY FOODS

The foods on the market prepared for purposes of infant-feeding are very numerous. From our knowledge of the composition of mother's milk we learn what nutritional elements are required, and approximately in what relative proportions these elements must exist, in order to supply the child with the food which nature intended him to have. The examination of the milk of thousands of nursing women shows that it contains from 2.5 to 4 per cent. fat, 6 to 7 per cent. sugar, and 1 to 1.5 per cent. proteid; and this furnishes the balanced ration with normal caloric requirements. These figures may be put down as the normal limits of human milk, and they are so, simply because the infant will thrive and grow when the nutritional elements in approximately the above proportions are supplied to him. It is within these limits that the food must be kept in order that there may be normal growth and development; though, of course, wide variations from these may be of temporary occurrence. While the child may exist and temporarily do fairly well on a percentage of fat lower than 2.5, he will invariably show defective growth if the proteid remains persistently under 1 per cent. The chief disadvantage in the infant foods which are used without the addition of cow's milk, lies in the fact that they do not contain the nutritional elements as they exist in normal breast-milk, and besides, of necessity, they are all cooked foods.

In selecting a substitute for mother's milk (p. 48) one point is to be kept in mind, viz., the substitute should contain, in a readily assimilable

form, the nutritional elements in approximately the proportions and forms in which they exist in mother's milk. All other feeding is defective. It is not well to put too much reliance on the analysis sometimes published by the proprietary food manufacturer. This type of food is decidedly weak in animal fat for the reason that there is no means of keeping more than a small percentage of it in a food without its becoming rancid. When considerable percentages are indicated in the analysis, it is certain that the fat does not consist of butter-fat. The quantity of animal milk proteid is likewise deficient, and what is present has been cooked, which detracts materially from the value of the food in infant nutrition. Scurvy is not an infrequent result of the exclusive use of these foods.

The Uses of Proprietary Dried-milk Foods.—It is to be remembered that this type of food is condemned because of its being an unsuitable food when used exclusively and persistently. Hysteric, general condemnation of the proprietary infant foods is unjust. Throughout this book the uses of the proprietary foods will be mentioned from time to time and dwelt upon. Milk is often an important factor in the production of constipation; and the importance of this food in the nutrition of "runabout" and older children who are on a general diet is secondary. In such cases cow's milk may be replaced by one of the proprietary dried-milk, malted foods which has a laxative effect. I sometimes employ them in other disordered states. During acute illness and in convalescence from illness and in certain forms of malnutrition such foods are usually readily digested and may help us over difficult places.

Proprietary Foods to Which Fresh Cow's Milk is Added.—These are not foods in the usual acceptation of the term, and if they are used alone, independent of milk, the patient will soon present a sorry spectacle. They are largely sugars, being composed of maltose and dextrose, which are derived from starch. Some contain a considerable quantity of unconverted starch. When added to the water and milk mixtures they furnish the soluble carbohydrates and free starch, and thus fulfil this function of the food with results as good as, but usually no better than, those obtained with milk-sugar and a cereal gruel. Maltose is a laxative sugar. In some cases of constipation in the bottle-fed it may replace the milk-sugar in equal quantity, with decided advantage. In other cases this change to maltose is without effect. The claim that, when added to cow's milk, these proprietary foods increase the liability to scurvy, is without foundation. If the milk is given uncooked, the child will not have scurvy, regardless of the nature of the carbohydrate; if the milk is heated to 160° or 170° F., the child may have scurvy regardless of the carbohydrates.

The exploiting of photographs of crowing, fat, red-cheeked babies to illustrate the supposed virtues of this or that manufacturer's food composed principally of maltose is not a very high-minded procedure on the part of the manufacturer who thus stoops to steal the credit which belongs to a cow! According to my observation, the statement that the addition of maltose to cow's milk facilitates its

digestion is unfounded. I have tried this method in many cases, but have never been able in consequence to use a stronger cow's-milk mixture, a higher proteid. The true test of such a measure is in treating the delicate and in feeding difficult cases, rather than well babies, who thrive regardless of the carbohydrate employed. The maltose preparations, then, in the sense that they may contain a small amount of proteid and a laxative sugar, are useful and to be recommended when such a carbohydrate is needed.

The Proprietary Beef Foods.—Numerous preparations of this nature are on the market, and there has been abundant opportunity to test their value. Without going into a lengthy discussion as to how and under what conditions these preparations have been used, it is sufficient to say that as a means of nutrition for children they play a very unimportant part. Their principal use is in illness, in which they act as a stimulant, and to a less degree as a food. They all make weak proteid mixtures when diluted so that the child can take them. The possibility of supplying any great amount of nutrition to the economy by their use is impossible; occasionally, however, they may be used to advantage. When milk is withdrawn, they may be added to the cereal gruel substitute. If there is diarrhea, great care must be exercised, as the proprietary beef preparations as well as beef-juice may aggravate this condition. On account of the creatinin which they contain, these foods should not be given in any of the forms of nephritis. Another feature which limits their use is that a child soon tires of them. They can rarely be given more than two or three times in twenty-four hours. Valentine's is the preparation I usually select. It may be given in solution—one-quarter to one-half teaspoonful to six ounces of the diluent.

CREAM

Market creams are known as "gravity cream" and "centrifugal cream."

Gravity Cream.—Gravity cream is obtained by allowing the milk to stand for a certain length of time and then removing the cream. When milk, as soon as it is drawn, is placed in a quart milk-bottle or fruit-jar and kept at a temperature of between 40° and 50° F., most of the fat will have risen at the end of five hours. When the cream is carefully removed at the end of this time, from 0.3 to 0.8 per cent. of fat will remain in the milk. The fat content of gravity cream is subject to considerable variation, depending, of course, upon the richness of the milk and the manner in which it is treated, particularly as relates to rapid cooling. In the cream from well-kept grade cows the fat will average about 16 per cent. In cream from well-fed Alderney or Jersey herds it may be as high as 20 per cent., or higher. In cream from cows indifferently fed, in those which subsist entirely upon poor pasturage, the fat may be as low as 10 or 12 per cent. For infant-feeding, gravity cream from the milk of grade cows is preferred. In using cream for infant-feeding all the cream to the milk line should be removed, as the upper layers are much richer in fat than that adjoining the milk. Further, when cream is mixed with milk both

must be of the same age, as the addition of older, bacteria-laden cream to fresh milk will surely result in grave digestive disorders.

Centrifugal Cream.—Centrifugal cream is that which is removed by an apparatus known as a separator, which consists of a circular bowl for holding the milk, so arranged as to make from 3000 to 5000 revolutions a minute. This results in a rapid separation of the lighter fat from the milk. The fat collects near the center of the bowl and is removed by a device arranged for this purpose. The skimmed milk flows outward from another portion of the bowl by a similar device. Centrifugal cream is more difficult of digestion than gravity cream in that the natural emulsion in which the fat is held in the milk is destroyed by the process of centrifuging. Centrifugal cream may vary greatly in its fat content, depending upon the rapidity of operation of the separator. According to Babcock and Russell, the proteids also undergo a change, which does not add to their nutritive value.

STERILIZATION AND PASTEURIZATION OF MILK

The sterilization and pasteurization of milk, as the terms imply, are for purposes of preservation. The term *sterilized milk* is applied to milk that is heated to the boiling-point and maintained at that temperature.—212° F.,—for twenty minutes. The effect of sterilization is the destruction of the pathogenic bacteria, but it will not destroy the spores. Dr. R. G. Freeman's most recent observations show that heating the milk to 140° F. and maintaining it at this point for one hour is of advantage, in that the bactericidal effects are as good as when a higher temperature is used. At the same time the lower temperature produces less chemical change in the milk. *Pasteurization* consists in heating the milk to 167° F., maintaining it at that temperature for thirty minutes, and then quickly cooling it. The effect of sterilization and the rapid cooling is to kill the existing bacteria, thus preventing, temporarily, further bacterial growth in the milk.

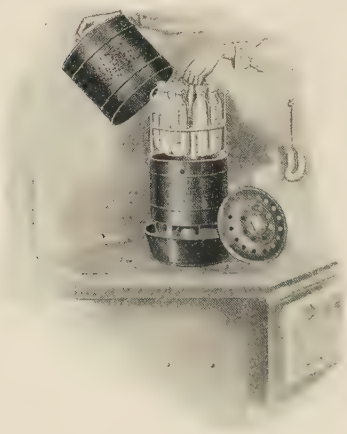


Fig. 10.—Arnold sterilizer.

The milk which is boiled in a bottle which is properly covered is "sterilized milk," but if the sterilization is to be carried on day after day an Arnold sterilizer (Fig. 10) should be used. For purposes of pasteurization the Freeman pasteurizer (Fig. 11) is recommended. Pasteurization makes less change in the character of the milk content; consequently there is less interference with its nutritive value. The temperature, too, 167° F., is sufficiently high to destroy pathogenic bacteria, including the Bacterium lactis and the Bacterium aërogenes,

and hence acts as a valuable preservative, particularly during hot weather.

Pasteurization Safest for Exclusive Use.—The question, whether milk should be given sterilized, pasteurized, or raw, has given rise to endless discussion in the press and in medical societies. Each method has its advocates. Among the pediatrists at the present time, some contend that milk should be sterilized, regardless of the season of the year, the character of the milk, or the station in life of the patient; others maintain that invariably it should be given raw, regardless of the above-mentioned conditions; while still others are devoted to pasteurization. If any of the methods were to be used exclusively, pasteurization, being the safest, should be selected. Judging from my

Fig. 11.—Freeman pasteurizer.

own experience in the matter of the heating of milk for infant foods, the subject should be considered from a broad standpoint. There is no one way of heating milk that is invariably the best. According to my observation, there are several factors which determine which is the proper procedure in a given case.

Raw Milk Preferred if Fresh and Pure.—There is no doubt whatever that the less the milk is heated, the better food it is for the average well baby, provided it is clean when procured and can be kept clean and sweet until it is used. (See Cow's Milk, p. 49.) This is possible in some of our dairies of the better class; it is possible with many who live in the country, or who go to the country for the summer and who keep their

own cows or who get their milk-supply from a neighboring source which they can control. Under such conditions the milk may be given raw during the entire year.

When, however, the milk has to be shipped a considerable distance during the summer, when its safety depends upon the industry and carefulness of the employees of a milk-farm, I find it advisable to pasteurize the milk during the heated term; therefore the majority of my private feeding cases get raw milk during eight months of the year and pasteurized milk four months. Sterilized milk is never used among these patients except during an ocean journey (see Milk for Traveling, p. 103) or a long-distance journey by land. Among out-patients, after feeding many thousands of them, I find the following scheme the safest: From May 1st until October 1st the milk is boiled (sterilized). These people, most of them, cannot afford a pasteurizer or sterilizer or understand the use of either. From October 1st to May 1st the milk is given raw. Pasteurization would be preferable, but it is possible with but very few dispensary patients. Even the giving of cooked milk, which unquestionably often becomes infected after cooking, is attended with no little risk to the child, as is shown by the death records of bottle babies during the summer. The giving of the cheap market milk raw to infants of the tenements during the heated term in any large city can only help to increase the terrible mortality of this season.

The object of heating the milk should always be explained to the mother so that she may appreciate the necessity of keeping it carefully covered and properly caring for it afterward. The idea is prevalent among uninformed people that after sterilization but little further protection is required. When I am satisfied the out-patients have not the requisite intelligence nor the means for keeping cow's milk during the summer, such as an ice-box and ice, I discontinue the ordinary milk-feeding for the hot months and use condensed milk instead (p. 114).

THE EFFECT OF HEATING MILK UPON ITS ASSIMILATION

Concerning the treatment of milk in order to make it easier of utilization, we have much to learn. The milk proteids lend themselves to influences which entirely change their character, and affect their utilization by the infant. The heating of milk influences its digestibility and heating with different substances produces further changes in this respect.

As previously stated, evaporated milk is easily and effectively utilized by the infant with a very weak digestive system, and this milk has been subjected to a heating process.

A certain child cannot take fresh cow's milk, modify and adapt it as we will. We give him evaporated milk of the same nutritional value and he thrives. This I have demonstrated in many private cases and at the Babies' and New York Nursery and Child's Hospitals. The digestive ferments were unchanged and the food capacity remained the same; the change that took place was in the most important of the milk constituents, the proteid content. The degree of heat used and the length of

its application also have a controlling influence on the digestibility of milk. The most favorable effects are produced through heating milk in the presence of starch and an alkali or antacid.

For example, an infant suffering from malnutrition is given a formula of—

10 ounces milk (top 15).
1 ounce milk-sugar.
½ ounce barley flour (Cereo).
20 ounces water.
10 grains bicarbonate of soda.

The food agrees to the extent that the child is comfortable, but he fails to make a substantial gain. He gains and loses an ounce or two weekly. We now order that the milk be cooked in a double boiler for thirty minutes and that water be added at the completion to make up for that which passes off in evaporation. The food is given in the same amount at the same interval, and at once the child begins to take on weight. The feeding schemes have been identical excepting that in the latter we have added heat. Such an outcome will not take place in every case, but I have demonstrated this effect time and again.

Repeatedly, when an infant has been brought to me because of malnutrition, although the child was getting a rational cow's milk formula, I have continued the milk strength as it was, simply changing the carbohydrate, milk-sugar, or dextromaltose to starch and malt soup, mixed together with the milk and cooked for thirty minutes in a double boiler. The same carbohydrate caloric value has been maintained; the food has been given in the same amount and at the same interval. As a result of such changes I have many records showing a prompt and continuous gain.

In many cases, every year, I use malt soup, starch, and milk cooked together because I am obliged to get results. I use the evaporated milks for the same reason. It is a fact also that a combination of evaporated milk, starch, and milk-sugar and bicarbonate of soda will be better utilized by very troublesome cases if they are cooked together. In like manner I use malt soup and starch with the evaporated milk.

There is no doubt whatever that in troublesome feeding cases the heating of milk with an alkali and starch renders the milk easier of utilization by the infant. Of course, the milk strength has to be carefully adjusted, and the feeding intervals and quantities must be adapted to the age and weight of the child. Perhaps stomach washings will be required. In other words, the physician must possess judgment as to these matters. Not a little of the success attained in infant-feeding depends upon the experience and judgment of the physician.

SCIENTIFIC INFANT-FEEDING

I was recently taken to task by a young colleague for using evaporated milk, malt soup, dextromaltose, and various flours, such as barley and Imperial Granum, in feeding difficult cases. It was unscientific to use these substances, the argument maintained, because the human breast did not elaborate evaporated milk, malt soup, barley flour, or dextromal-

tose. Instead of such substances, fresh cow's milk, lime-water, milk-sugar (Squibb's), and boiled water should be employed. I replied that I had used the substances enumerated daily for twenty-five years and had fed several thousands of infants on fresh cow's milk, milk-sugar, and lime-water; while in my experience with many nursing mothers in institutions and in private work I could not recall a single instance wherein the human breast had secreted fresh cow's milk, lime-water, or Squibb's milk-sugar.

Scientific infant-feeding consists in supplying a balanced ration of fat, proteid, carbohydrate, and mineral salts in an assimilable form upon which the infant makes normal development. Neither the fat, proteid, nor carbohydrate must be of one invariable form. Nature permits of a wide latitude.

In function, moreover, the fat and carbohydrate are interchangeable and may vary widely in nature and in quantity. There must, however, be a fairly definite content of proteid of a nature that admits of its utilization; or we shall have varying degrees of malnutrition and marasmus; for without nitrogen and other proteid constituents cell growth is impossible. By the use of starch and alkalis, the subjection of milk to the influence of heat of varying degrees, and by other means, we may change the nature of the proteid to such an extent that the infant may utilize the food in a manner before impossible.

An immense amount has been learned concerning infant-feeding during the past twenty-five years. Our scientific attainments, however, will be much greater after a few more decads, and even then the last word will not have been spoken.

DIFFICULT FEEDING CASES IN INFANTS

The problem which confronts us in such a case is often most difficult of solution.

Chapin is an advocate of the use of cereal gruel as a diluent, claiming that the milk is rendered more easily digested because of the presence of the starch. Others believe that the use of alkalis and antacids renders the milk easier of digestion. Personally, I have had very little success in fitting such special modifications of fresh cow's milk to difficult cases. In very few of these difficult cases that come to me do the ordinary cow's-milk dilutions and adaptations produce satisfactory results. The majority are infants who cannot digest cow's milk unless it is materially changed by other than mechanical methods. It is also to be remembered that in difficult feeding the food is only a part of our troubles. The physical condition of the child, his care, and particularly the containing and working capacity of the stomach, are matters requiring thought and adjustment. Our duties do not end with a change or series of changes in food.

A difficult feeding case requires:

1. Fresh air. Indoor airing in winter or roof treatment—cold air.

2. Clothing sufficient to insure warmth; particularly must the extremities never be cold.

3. Quiet—absence of handling other than is necessary for cleanliness. Quiet is particularly necessary if there is a tendency to regurgitation or vomiting.

4. Stomach washing—a most useful procedure, even when there is no vomiting. A stomach lavage cleans out the mucus and undigested material from the stomach, which is very apt to be enlarged and of defective motility. The lavage may be used daily for a week, or less frequently—perhaps every other day. In some cases one or two washings suffice. In others lavage is continued at intervals determined by the condition—rarely longer than three to four weeks.

Milk.—The various forms of so-called peptonizing processes have obtained very little success in my hands, and I rarely employ this means and do not advise it.

The methods that have been useful in nourishing these infants are as follows:

Whey Feeding.—In some cases the feeding of whey (p. 105) may be of service. This means is not of very general application, as a milk laboratory or a very competent nurse is required to prepare the whey.

Malt-soup Feeding.—The use of malt soup for infants after the fourth month is of much value in treating malnutrition and marasmus. For very young infants, also, malt-soup feeding is occasionally applicable, although the feeding of children before the third month by this method will result in more failures than successes.

Contraindications to the use of malt-soup feeding at any age are vomiting and a tendency to looseness of the bowels. A considerable part of the digestive ailments of the very young include vomiting, so that this symptom must be controlled before malt-soup feeding is attempted. In feeding an infant under ten weeks of age in whom vomiting is not a symptom we may occasionally use malt soup with success. The patient most benefited by this feeding is the infant after the third month who is not actively ill, but who fails to thrive or who is made actively ill by the use of the ordinary milk modifications.

I have had many children brought to me who had been carefully fed on modified cow's milk, in whom the milk had produced some disorder, such as colic, vomiting, or constipation. Such children very frequently appear comfortable and take the food eagerly, but make little or no gain in weight and do not thrive. They are pale, thin, sleep poorly, and are underweight two to five pounds. I have in hundreds of cases used the identical milk formula which the child was getting, and simply replaced the sugar of milk or the cereal flour which furnished the carbohydrate by malt-soup extract and some flour preparation, with the resulting prompt response of a gain in weight of four to eight ounces weekly, although there had been a standstill for weeks.

It is impossible to advise any definite milk strength in these cases, as the condition to be treated is abnormal, and wide variations in milk strength may be necessary. In general, the physician may select a milk formula which he considers applicable to the patient's weight and condition, and then, instead of using cereals or milk-sugar, use the

malt-soup extract after the following manner. We may suppose that 10 ounces full milk daily is to be prescribed. The formula will read as follows:

10 ounces milk.
20 ounces water.
1½ tablespoonfuls barley flour (Cereo or Robinson's).
1 tablespoonful malt-soup extract.

The amount and feeding intervals are the same as for other methods of feeding. The barley is mixed with the milk; the malt mixed with the water. Both mixtures are stirred well together, placed in a double boiler, and allowed to simmer (kept under a boil) for thirty minutes. During the cooking process the mixture should be stirred frequently. At the completion of the cooking, water previously boiled is added to make the mixture 30 ounces. This is strained through a coarse-meshed strainer, and is then ready for use.

If the child shows a tendency to vomit the food, the malt may be reduced one-half temporarily, or skimmed milk may be employed. When skimmed milk is used, from two to four ounces more should be added to the daily supply of food in order to make up to the child the loss of nutrition entailed by removal of the cream. As the food is found to agree, the milk strength may be gradually increased.

Condensed Milk.—A satisfactory method of starting difficult feeding cases toward recovery consists in the use of condensed or evaporated milk.

Condensed milk is in the market in three forms—*fresh condensed milk* sold in bulk, *condensed milk to which cane-sugar is added*, sold in hermetically sealed cans, and *evaporated milk* without the addition of sugar, sold in hermetically sealed cans. The best known and most readily available brands are Borden's condensed milk, known as the Eagle brand, and Borden's evaporated milk, known as the Peerless brand. The Eagle brand contains cane-sugar in considerable amount, and is rarely used. The Peerless brand is evaporated milk without the addition of sugar. In the condensing process the milk is heated to 200° F. It is then transferred to vacuum pans, where it is maintained at a temperature of 125° F. until sufficient water is evaporated to bring the product to the required condensation.

The analysis of the Eagle brand is as follows:

Fat	9.5	per cent.
Sugar	54.67	" "
Total proteid	7.84	" "
Ash	1.68	" "
Water	27.31	" "

The analyses of Peerless brand evaporated milk and the unsweetened condensed milk sold in bulk are very similar. The standard maintained is as follows:

Fat	8.3	per cent.
Sugar	10.05	" "
Proteid	7.1	" "
Ash	1.43	" "
Water	73.07	" "

In using condensed milk for feeding, that known on the market as *evaporated milk* should be used. In using this variety it must be remembered that a fresh can must be opened daily. The fact that this milk is free from added sugar makes possible the feeding of a larger amount. One part of the milk to three, five, six, or more parts of diluent may be used. Thus, the formula for a day's food would read like the following:

7 ounces evaporated milk.
28 ounces water.
carbohydrate { starch / sugar } { starch. / malt-soup extract.
10 grains bicarbonate of soda.

Milk of this strength affords a nutritional value of 1.66 per cent. fat, 1.43 per cent. proteid, 2.01 per cent. sugar. To this mixture carbohydrate in the form of starch, cane-sugar, dextromaltose, milk-sugar, or malt-soup extract may be added to raise the total carbohydrate to 6 or 7 per cent. If malt soup and starch are used, cooking will be required. (See Malt-soup Feeding, p. 113.) More or less of the evaporated milk may be used as may be required. Many infants of very weak digestion will thrive on the evaporated milk thus given when all other artificial methods fail. To the very young, and those with poor digestive capacity, and to athreptics, a lesser amount of milk may be given at first,—one part of milk to seven or eight of diluent,—the quantity being increased as the infant shows improved capacity.

As the child grows older and increases in weight the amount of evaporated milk may be increased. I have never given a stronger formula than 14 ounces of the evaporated milk (Peerless brand), 26 ounces water, carbohydrate to 6 or 7 per cent. The weight chart (see Fig. 12) shows the progress made by a child on this scheme of feeding. Notes on the chart indicate when the evaporated milk feeding was begun and the various strengths used. Previously the child had been given various fresh cow's-milk formulas.

In not a few cases the food will be better assimilated if the entire mixture—milk, starch, sugar, and soda—is kept just under the boiling-point in a double boiler for thirty minutes. Occasional stirring is necessary, and at the completion of the heating process water should be added to bring the food to the original amount.

Plain Milk.—When the child has remained comfortable for six to eight weeks or longer on such feeding, almost always with a gain in weight, one feeding daily of a plain milk mixture may replace a feeding of condensed milk. A raw milk mixture should always be given in weaker strength than the child's age calls for. In spite of the dilution it may occasion indigestion, colic, and the passage of curds. In such an event the condensed milk and its diluent must again be the sole diet for two or three weeks, when the use of ordinary milk may again be attempted. After a few days or a week, in case one such feeding is taken without inconvenience, a second feeding may replace another condensed milk feeding. In this way the number of plain milk feed-

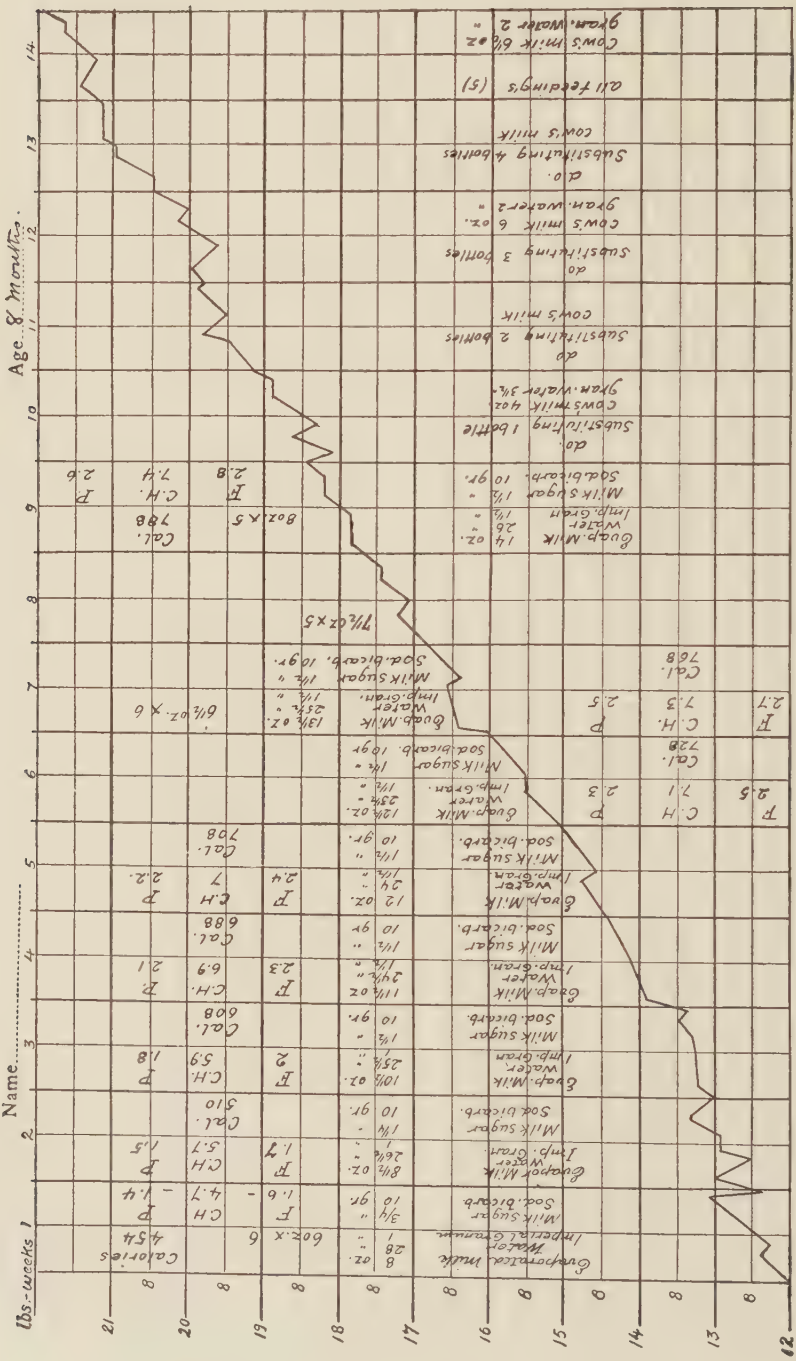

Name.....
Age...8 Months.
Lbs.-weeks 1
Evaporated Milk 8 oz. 28 " Water Imperial Cream. 6oz. x 6
Milk Sugar 3½ " Soda bicarb. 10 gr. F 1.6 - 4.7 - 1.4
Evap. Milk 8½ oz. Imp. Water 26½ " Cream 1.7 2.8 5.7 1.5
Milk Sugar 1½ " Soda bicarb. 10 gr. 310
Evap. Milk 10⅔ oz. Water 23½ " Imp. Cream 5.9 1.8
Milk Sugar ½ " Soda bicarb. 10 gr. 608
Evap. Milk 11⅓ oz Water 29½ " Imp. Cream. 2.3 6.9 2.1
Milk Sugar 1½ " Soda bicarb. 10 gr. 688
Evap. Milk 12 oz. Water 29½ " Imp. Cream 2.4 7 2.2
Milk Sugar 1½ " Soda bicarb. 10 gr. 708
Evap. Milk 12⅔ oz. Water 23½ " Imp. Cream 1½ " Milk Sugar 1½ " Soda bicarb. 10 gr. 728
Evap. Milk 13½ oz. Water 25½ " Imp. Cream 1½ " Milk Sugar 1½ " Soda bicarb. 10 gr. 6½ oz. x 6
7½ oz x 5
Evap. Milk 14 oz. Water 26 " Imp. Cream 1½ " Milk Sugar 1½ " Soda bicarb. 10 gr. 8oz. x 5 F 2.8 C.H. 7.4 P 2.6 Cal. 788
do. Substituting 1 bottle Cow's milk 4oz. Water 3½ "
do Substituting 2 bottles Cow's milk
do Substituting 3 bottles Cow's milk 6 oz. Water 2 "
do. Substituting 4 bottles Cow's milk
All Teething's (5)
Cow's milk 6½ oz Water 2 "
Calories 454
P 2.5 C.H 7.1 P 2.3 Cal. 728 P 2.7 C.H. 7.3 P 2.7 Cal. 768

Fig. 12.—Chart showing progress made on evaporated milk. Food value indicated in percentages and calories.

ings may be gradually increased until the child is taking a rational diet of this milk alone. A six-months'-old baby took daily three feedings of condensed milk and three of raw milk. Attempts were made to give him the fourth feeding of raw milk, but invariably with disastrous results. He was slightly under weight, but in a fair general condition.

I have successfully managed a great many of these difficult feeding infants, as described above, withholding ordinary milk feeding until the child is taking the condensed milk well and gaining, then gradually advancing the raw milk feeding until, when the child is five or six months old, he will be taking daily and assimilating two or three feedings of the fresh milk. When six months old, and sometimes earlier, he may be given suitable raw milk feedings exclusively. I have found that by the above method the desired end of complete plain milk feeding is reached sooner than when small quantities of cow's milk are added to the condensed milk mixture.

In beginning, it is best to give the raw milk at the first or second feeding in the morning, when the digestive powers are stronger than they are later in the day. When the second raw milk feeding is given, it should never immediately follow the first. The raw milk and the condensed milk should be alternated until more than one-half of the daily feedings are of fresh milk.

Idiosyncrasies to Cow's Milk.—At rare instances cases are encountered in which there exists an intolerance of cow's milk or any form of food which contains cow's milk, including condensed milk and all the malted foods containing desiccated cow's milk. In such cases the use of any of these substances as foods produces illness of such an alarming type as to necessitate prompt discontinuance of the food. The only hope for infants thus constituted is a wet-nurse.

Illustrative Cases.—An illustration of allergy to milk foods occurred in my own family. A healthy, full-term female infant whose birth-weight was 7 pounds 12 ounces was nursed by her mother with indifferent success for two weeks, when the supply failed absolutely. Feeding with a most carefully prepared modified cow's milk was begun. The child refused the food, and two drams were forced. This was followed, in a few moments, by vomiting and retching, which continued at intervals for twenty-four hours, with collapse and exhaustion to an extreme degree. A wet-nurse was secured, the breast was well taken, and the milk agreed perfectly. In three days the wet-nurse's milk began to fail and was entirely lost in twenty-four hours. A weak dilution of condensed milk was then given, with results almost as disastrous as before. The child at this time weighed 6 pounds 4 ounces, and showed all the symptoms of early marasmus. A second wet-nurse was secured whose milk also failed in a few days. Before her departure, however, a third nurse was engaged, on whose milk the child thrived most satisfactorily. When the patient was three months of age a weak cow's milk mixture, prepared by the Walker-Gordon Laboratory, was given. The child refused the food, and one-half ounce was forced. As on the previous occasion, vomiting with prostration bordering on collapse was the outcome. The child vomited at frequent intervals for twelve hours, and the breast was refused for twelve hours longer. The giving of cow's milk was not again attempted until the child was nine months old, a wet-nurse meanwhile being employed. The child was then strong and vigorous, and weighed 18 pounds. Two drams of cow's-milk mixture suitable for a child three months of age were given. This produced nausea and vomiting, as though an equal quantity of syrup of ipecac had been given, but no more serious disturbance. At this time the wet-nurse's milk began to fail. The breast-milk nutrition was assisted by the use of a cereal made into a thick

gruel. Oatmeal in the form of a gruel to which sugar was added was given, largely because of its high proteid content. Beef-juice, scraped beef, and pure cod-liver oil were also given about this time. At the completion of the first year a portion of a soft egg was added to the diet. Zwieback and bread-crusts soaked in sugar-water were also used. These solid substances were given two or three times a day, after which the child was nursed. Pure cod-liver oil was given almost continuously during the second year. Butter-fat could be taken without inconvenience when she was one year of age. Following out the above lines of treatment, the child was weaned when thirteen months of age. She has since been fed with an entire absence of cow's milk from the diet. When six years of age her weight was 55 pounds, height 48 inches. She was normal in every respect, but six ounces of milk given at one time would produce a coated tongue, foul breath, constipation, and excessive irritability which was entirely foreign to her nature. At the twelfth year the intolerance for milk was entirely overcome.

The young mother of a vigorous, eight-months'-old breast-fed girl determined to wean the baby. The family physician prescribed a suitable formula. The child refused to take the milk mixture. A small quantity was taken and immediately vomited. After further unsuccessful attempts at feeding two ounces were forced. This was at 10 A. M. The child did not vomit, but passed into a condition approaching collapse. When I saw the child a few hours later she presented the appearance of a case of severe intestinal intoxication. She was very apathetic, but could be aroused with difficulty. The pulse was small, very soft, and thready. The respiration was superficial, but not rapid. The eyes were sunken, the skin blanched. In spite of active stimulation and external heat the child grew gradually weaker, making but temporary response to stimulation, and died seventeen hours after the milk had been given. The case was one of anaphylactic shock from the milk proteid. I have seen many cases of allergy to foods, but this case is my only fatality.

A boy whom I treated for colitis last summer gave a history of allergy to milk. The placing of a few drops on his tongue would be followed immediately by intense general urticaria.

A vigorous, nine-months'-old breast baby was given a feeding of cow's milk and vomited it at once. In a few days another feeding was attempted. The child took only a swallow or two of the food, but at once developed general urticaria. The ears suddenly became several times their normal size, and the eyelids swelled and closed the eyes. The respiration became greatly inpeded through edema of the glottis to the extent that the mother feared the child would suffocate. I saw him six hours later; the voice was still hoarse and croupy. Three weeks later five drops of milk were placed on this baby's tongue. In three minutes he vomited and became decidedly pale; in a few minutes more he vomited again. This was followed by hiccup which lasted until he left the office one-half hour later. The child is still under observation, and so sensitive is he to milk proteid that a vaccination with milk will produce at the site of the scarification a large urticarial wheal. The wheal is also produced by egg-white. Many cases show intolerance to milk, but in lesser degree.

Idiosyncrasy to Other Food Substances.—Children may show idiosyncrasy to various food substances.

Dr. O. M. Schloss,* of New York, calls attention to a case that was sensitized to egg-white, oatmeal, and almonds to such degree that a cutaneous reaction occurred to these substances. Infants and young children may show this intolerance to any food containing protein. I have seen several cases of egg intolerance, and at the present time have a child under observation who was made violently ill by egg, and who shows a most marked cutaneous reaction. The cutaneous inoculation is made as follows: A slight scarification of the skin, usually on the arm, is made, barely sufficient to draw blood; into this abrasion a small amount of milk, egg-white, or whatever substance is to be tested is very gently rubbed. In a few moments, in the sensitized subject, an urticarial wheal appears which constitutes the skin reaction. Dr.

*American Journal Diseases of Children, vol. iii, p. 341.

Schloss, who has added materially to our knowledge of food idiosyncrasies in children, writes as follows:

"In certain individuals hen's eggs may be responsible for toxic symptoms which vary in severity in the individual cases. The symptoms arise from the gastro-intestinal tract, the skin, or the respiratory tract, and are accompanied in some cases by collapse.

"From our present knowledge it seems that in some cases the idiosyncrasy is inherited. In other cases it is due to some change produced in the organism by the previous ingestion of eggs. There is a third group of cases in which there is no evidence that the idiosyncrasy is inherited, and in which toxic symptoms occur the first time egg is ingested. For this group of cases there is no adequate explanation.

"In many cases of idiosyncrasy to foods a cutaneous reaction occurs from inoculations of the food itself or proteids from the food. The reaction is immediate, appearing within a half-hour, and disappears within one and a half hours. I have never seen any remote reaction within twelve to twenty-four hours analogous to the von Pirquet tuberculin reaction. The reaction is not given by all cases of food idiosyncrasy, but is present, as a rule, in those with cutaneous manifestations and in the severer types. The reaction is not caused by all the proteins of the food. In one case of idiosyncrasy to egg ovomucoid was the active proteid. This patient gave a positive reaction to a 1:15,000 solution of ovomucoid. In one case of milk idiosyncrasy a reaction was caused by cutaneous inoculation of a 1:5000 solution of lactalbumin.

"In two cases of idiosyncrasy to eggs the injection of the patient's blood or blood-serum into guinea-pigs sensitized these animals so that a subsequent injection of proteid from egg-white caused severe toxic symptoms and death. The injection of blood or serum from normal individuals had no such effect. It therefore seems fair to conclude that the idiosyncrasy is due to a condition closely analogous to anaphylaxis in the experimental animals.

"In three cases it has been possible to induce complete immunity by feeding gradually increasing doses of the active proteids from egg-white."

SUBSTITUTES FOR STOMACH-FEEDING

In the management of the diseases of children conditions arise from time to time which necessitate the nourishment of the patient by channels other than the stomach. In persistent vomiting, when there is an acute involvement of the stomach, as in an acute gastro-enteric infection, in cyclic vomiting, and in vomiting due to some more remote cause, as meningitis or nephritis, the patient must receive water and food in order to sustain the system until the exciting factor is removed.

Nutrition by means other than stomach-feeding may be necessary in retropharyngeal adenitis or abscess, in stricture of the esophagus, in diphtheria, in the exanthemata, and in pneumonia during the course of active delirium. A substitute for stomach-feeding is often useful in marasmus, in the generally delicate, and in those with reduced assimi-

lative powers. Various means of substitute feeding have been attempted from time to time. Nutritive suppositories have been advocated and proved failures, perhaps because of our inability to place them sufficiently high in the bowel. Placed in the rectum, they excite peristalsis and are expelled.

Hypodermic Feeding.—Hypodermic feeding, and the introduction of food into the circulation are unsafe and impracticable in the treatment of children.

Feeding by Inunction.—Feeding by means of oil inunctions, by active friction, or by the more passive means of wrapping the child in oil-soaked cotton and allowing him to rest in it, is thought by many to be effective, in spite of the fact that the skin is an organ of excretion, and that its powers of absorption are very slight. I am convinced that, for infants and young children, the inunctions of properly selected oils possess distinct nutritive value, more benefit being derived by the patient than can be attributed to the lubrication of the skin and the massage. The rubbing of mercurial ointment into the skin is one of the most familiar means of introducing mercury into the circulation. No one will dispute the efficacy of this form of treatment. Fat inunctions are useful for marantic infants, and delicate "runabouts" with low fat-digestive capacity. In chronic diseases also, such as tuberculosis, syphilis, and rheumatism, oil inunctions are of advantage. They may be used with advantage during convalescence from the severe acute diseases, which have not only reduced the patient's weight, but have so affected the digestive and assimilative functions that a return to health is materially retarded. A brine bath (p. 750) should precede the inunctions, which are best given at bedtime. If possible, an animal fat should be used. Goose-oil and unsalted lard are preferred. Cod-liver oil is never advised on account of its very disagreeable odor. Olive oil may be employed in case the unsalted lard or goose-oil is not obtainable. Cacao-butter is the least desirable of all fats that may be used for this purpose, particularly if the child is young and athreptic, for the reason that there may not be enough bodily heat to keep the oil fluid after it has been rubbed into the intercellular spaces and hair-follicles. For children under one year of age, it is my custom to direct that one-half ounce of goose-oil, unsalted lard, or olive oil be rubbed into the skin of the arms, thorax, legs, and back immediately following the salt bath. The rubbing is to be continued until the oil disappears, which may require from ten to fifteen minutes. The rubbing should be done with the palm of the hand and not with a brush or a cloth. In a few cases it is difficult to have the oil absorbed, even though not more than one dram is used. This condition is most common in those who most need the oil—athreptics with low temperature, in whom the superficial circulation is very poor. After the inunction the child should at once be put to bed. For older children, ½ to 1½ ounces of the oil may be used. How much will be required for the ten to fifteen minutes' rubbing will soon be learned. In these cases, also, the inunction should follow the brine bath. The use of the oil inunction in hundreds

of cases has proved its efficacy. How much of the beneficial effects are due to the oil as a food, how much to the massage, producing better skin action, improving the nutrition of muscles and inducing better sleep, I am unable to say. The beneficial effects of the inunction are probably due to three factors: The oil acts to a slight extent as a food, the massage increases the functional activity of the skin, and improves the muscle nutrition.

Rectal and Colonic Feeding.—Any means of treatment which is disagreeable both to patients and attendants, and difficult of execution, is very liable to fall into disfavor unless pronounced beneficial results are the rule. While absolutely nothing can be promised so far as supplying nutrition by this means is concerned, careful observation and experience tell us that in a certain number of cases the measure is of much value. When the treatment will be of service in nourishing the patient can be determined by trial only. In children, particularly in very young children, on account of the ease with which peristalsis is excited, nutrition by this means is less frequently successful than in the adult. Nevertheless, it has been of material assistance to me in many a trying situation. Not a few of the failures are due to a lack of appreciation of the details of the procedure. Directions to mothers or nurses to inject a

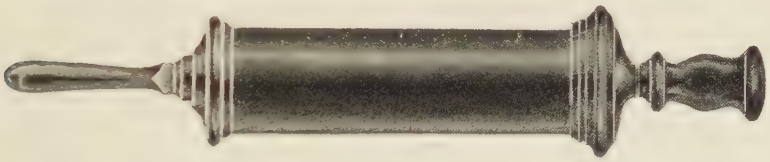


Fig. 13.—Hard-rubber piston syringe.

certain quantity of some particular food, unless specific instructions are given, will usually be carried out as follows: A hard glass or rubber tip will be passed into the rectum from one to two inches. Through this the fluid will be forced. In a very few minutes, perhaps immediately, the bowel will empty itself into the napkin or bed-pan, the enema being of no service. This is what may be expected and what will happen when the child is given the nutrient enema in this way. The hard tip placed within the anal ring, and the fluid, are very apt to excite vigorous perstalsis. In order that the nourishment may be retained, it should be carried high up into the descending colon. The advantages of this method are two: It is much better retained, and, on account of the greater surface of mucous membrane with which it comes in contact, it will be quickly and more completely absorbed.

How to Give a Nutrient Enema.—The nutrient enema is best given as follows: A soft-rubber catheter, No. 18 American, or a small rectal tube, adult size, is used, the former being preferred. The catheter or tube is slipped over the small tip of an ordinary fountain-syringe. The tube should not be too flexible nor yet too stiff. If too flexible, it folds readily on itself when the point meets with any resistance, and the fluid

escapes perhaps an inch or two within the anal opening. If the tube is too rigid or if force is employed, the mucous membrane and the parts may very easily be lacerated.

The position of the child while the enema is being given is important. He should rest on his left side, preferably in Sims' position, with the buttocks elevated to a plane at least four inches higher than the shoulders. A pillow or a folded blanket covered with a rubber sheet should always be available for this purpose if a bed-pan is not at hand. The child, if old enough to understand, is assured that no harm will come to him. With the patient in position and an assistant to hold him, the anus is covered with vaselin. It is not enough to oil the tube. The tube attached to a fountain-syringe is warmed and well oiled and passed into the rectum. The lower end of the bag should be three feet higher than the child's body. There may be some straining at first, but with the child in a proper position, one may pass a tube of the right degree of flexibility high into the intestine in a few seconds. The tube should be introduced about nine inches—far enough at least to be felt in the descending colon when the fluid is allowed to pass rapidly into the bowel. When the bag is emptied, the tube is rapidly withdrawn and the child, although allowed to change to the dorsal position, is encouraged to rest on his side. In any event, the buttocks must be kept elevated for at least one-half hour. In using small amounts of fluid it is well to allow for the quantity which may remain in the tube of the syringe and in the catheter after the enema is given. In managing older children, who exert much bearing-down or straining, it may be necessary to attach the catheter to a Davidson syringe or to an ordinary rubber (Fig. 13) or glass piston-syringe of large size, in order to provide sufficient force to overcome the pressure exerted by the abdominal muscles.

The nutriment should be neither too hot nor too cold. With either of these extremes, peristalsis is apt to be excited. I have found a temperature of 95° F. to be the most satisfactory. If bowel action has been fairly free, previous washing with a normal salt solution is not necessary. If there has been no movement for six hours, it will be well first to use an irrigation of normal salt solution. Glycerin should not be used. The irrigation should precede the enema by from fifteen minutes to half an hour.

Nourishment Not to be Used in the Rectum.—Oils or fats in any form, even though pancreatinized, should not be used. Alcohol should be used only in very urgent cases, and then it should be well diluted and used not oftener than once or twice in twenty-four hours. It has a decidedly irritant action on the intestinal mucous membrane and is not well retained. When used, it should be diluted with from 12 to 16 parts of water or an equal quantity of skimmed milk, which has been peptonized or pancreatinized. In giving stimulants by the rectum, whisky is usually employed in quantities from one-fourth ounce for a child two years of age, to one ounce for a child from six to ten years of age.

Nourishment to be Used.—By far the best food for rectal alimentation is skimmed milk completely pancreatinized. It is better retained and more completely assimilated than any other form of nutriment which we possess, as is shown by its results in maintaining the nutrition and strength of the patient. In cases in which it is desired that a considerable amount of fluid be absorbed by the intestine, the pancreatinized milk may be diluted with a normal salt solution. Where such milk is not available, the whites of three raw eggs, mixed with a normal salt solution, may be given. Not infrequently I order the whites of one or two raw eggs given in the pancreatinized skimmed milk, believing this combination gives us the best form of nutrient enema. The predigested proprietary preparations, the so-called "peptones," have not been satisfactory in my hands.

The amount of nourishment to be used at one time varies with the age and condition of the child.

ORDINARY AMOUNT TO BE GIVEN IN ENEMA

Under three months	2– 4 ounces
From three to six months	4– 6 ounces
From six to twenty-four months	6– 8 ounces
After the twenty-fourth month	8–16 ounces

Because the first enema is not retained, it does not follow that a second given immediately thereafter will share the same fate. In not a few instances, when I have given the second enema ten minutes after all or the greater part of the first had been expelled, the entire second amount has been retained. It is rarely wise to repeat the enema oftener than at six-hour intervals; and, when the intestine shows a tendency to intolerance, the intervals should be increased to eight or ten hours.

This means of nutrition in children is of temporary use at best. The period of its application in the average case, even when tolerated at first, is only two or three days. In a few instances I have been able to use the method longer.

Illustrative Cases.—During the summer of 1903 a very delicate three-months'-old child under my care, weighing six pounds and ten ounces, retained two ounces of completely pancreatinized skimmed milk, given at six-hour intervals for three days, and three ounces at eight-hour intervals for eight days longer, making a period of eleven days in which the enemata were employed. Such tolerance of the large intestine, however, is very rare.

In another case the use of enemata following an operation for intestinal obstruction with protracted vomiting and prostration unquestionably saved a child's life.

In a recent severe case of cyclic vomiting, which was seen in consultation, the vomiting had persisted for three days. This child was six years of age. He showed marked emaciation, and suffered from intense thirst; his pulse was weak and soft. A nutrient enema was given, composed of eight ounces of pancreatinized skimmed milk, eight ounces of normal salt solution, and the whites of two eggs. Not one drop was expelled. In one-half hour the boy claimed to feel better. The intense thirst was relieved and he fell into a restful sleep. In six hours the enema was repeated, about four ounces being expelled. This was followed by enemata at eight-hour intervals, eight ounces of the milk with the whites of two eggs being given, all of which was retained. At this point the vomiting abruptly ceased and further enemata were not required.

SCURVY (SCORBUTUS)

Scurvy in infants was first described by Glisson in 1651. It was not well recognized, however, until Möller described it again in 1859, viewing the disease as an acute type of rachitis. Ingelev, of Sweden, recognized a case of apparent infantile scorbutus in 1873, and in the period 1879-82 Cheadle reported several cases. In 1883 Sir Thomas Barlow was able to give a clear demonstration of the clinical features and pathology of this disease, and thenceforth reports of its occurrence were frequent. Infantile scurvy, or Möller-Barlow's disease, is a very definite affection, and, although the term "scurvy-rickets" still persists, this serves only to emphasize the frequent coexistence in a patient of the two essentially distinct conditions.

Pathology.—The two leading features in the morbid anatomy of scurvy are multiple hemorrhages and rarefaction of bone. Whether the atrophy in the bone is, or is not, a result of the intra-osseous extravasations, seems uncertain. It is, however, believed that the rarefaction may occur primarily, independent of the hemorrhagic lesions. Although in some instances hematuria is the only prominent symptom, bleeding is usually not confined to any particular site, but may occur under the periosteum, in the bone-marrow, under the skin, under the membrane lining the serous cavities, or from the mucous surfaces. In the bones, the most severe lesions are found in the neighborhood of the epiphyses. The lymphoid marrow cells and the osteoblasts are diminished in number, and there is increased porosity of the cancellous tissue. Fractures of the ends of the long bones are exceedingly common. In several cases I have seen separation of the epiphyses. In one case there were four so-called infractures—two at the shoulder-joint in each humerus, and two at the hips in each femur. Beneath the periosteum are extensive extravasations of blood, which frequently become organized into firm layers of clot. In rare instances hemorrhages occur within the joints.

In scurvy there are probably alterations in the capillary walls which permit the diapedesis of the red cells. Wright has recently shown that in this disease the alkalinity of the blood may be reduced to a point as low as $\frac{35}{200}$ of the normal, and he regards scurvy as a form of acid intoxication.

Autopsy upon a child that died from scurvy revealed extensive separation of the periosteum from all the long bones, from which massive clots of blood were removed.

Age.—The age incidence is significant. In a large number of cases I have seen but one over eighteen months of age; this was in a child four years old. Occasionally scurvy occurs in infants under six months of age, but this is unusual. My youngest case was in a nursing baby three weeks old. In this infant there was a separation of the epiphyses at both wrists. The immediate toxic agent causing the hemorrhagic condition has not been discovered. It seems proved that there is some constitutional error, usually due to nutritional defects,

which prepares the individual for whatever form of toxemia may be operative.

In most instances the nutritional defect may be ascribed to the use of cooked foods. The well-known collective investigation of the American Pediatric Society established the influence of foods that had been subjected to the influence of heat. Thus, 10 patients were entirely breast-fed, 4 were getting raw cow's milk, 116 were on pasteurized, sterilized, or condensed milk feeding, 214 were on proprietary foods. So pronounced a factor is cooked food in the production of scurvy that in all cases so fed I invariably give orange-juice, 2 or 3 teaspoonfuls daily.

The heating of milk invariably removes something from it which is necessary for the prevention of scurvy; nevertheless, such cooking does not interfere with its nutritional properties. This I have demonstrated in hundreds of cases.

Symptoms.—Malnutrition is not necessary for the development of scurvy, neither is previous illness a factor of much consequence.

The first sign noticed is that of evident pain upon manipulation of different portions of the body, most frequently one of the legs. The complaint is that the child cries when the napkin is changed, or when he is being bathed or dressed. Further, the child, instead of freely moving his arms and legs, allows one or more of his limbs to rest, while the others may be moved freely.

In advanced cases all the limbs may be involved, and the child makes no attempt at even changing the position of a limb, and cries vigorously when such a change is made. The position taken by the child is that of outward rotation of the limb or limbs affected.

In advanced cases the involved joint or joints will be swollen. The swelling may involve the entire limb. In a case occurring in my service at the Babies' Hospital the leg, from above the knee downward, was twice the size of the unaffected leg.

Upon manipulation the parts are excruciatingly tender. I have repeatedly had mothers complain that the child who previously had enjoyed attention in the way of handling and holding, preferred to lie quietly in his crib and apparently feared to be touched.

While the long bones are usually involved, the other bony parts may be affected. In two children the ribs, spine, and scapula were affected. The extremities were normal. Both infants were about nine months of age. They cried vigorously when they were lifted by placing the hands around the body under the arms. The diagnosis of scurvy was proved by the quick and complete response to orange-juice and the use of uncooked food.

A few ecchymotic areas may be found on the skin, but this is unusual.

Too much emphasis is placed upon this symptom, which is not an early manifestation and may not appear for two or three or more weeks after the first manifestation of the local lesion in the limbs. If the condition is not recognized, submucous bleeding almost invariably appears,

and is characteristic, providing the child has teeth in the upper jaw; the gums in the lower jaw are rarely involved. The gums are swollen, edematous, and bleed readily. Over teeth about to be erupted, blood blebs of a dark-bluish color may be seen. In the absence of teeth the gums are usually normal. In a very few cases I have seen a slight bluish discoloration. It is only in the very advanced cases that the lower gum and teeth will show involvement.

Hematuria to a slight degree is present in most cases. In a few instances it has been severe, showing macroscopic blood. Blood in the stools is of very rare occurrence.

Prognosis.—The prognosis is very favorable. All cases recover if a reasonably early diagnosis is made and proper treatment instituted. If there is simply an involvement of a joint, of short duration, the child may be well in two to five days. In cases in which extensive lesions have formed, two or three weeks or more may be required for complete recovery. The longest time under treatment in my cases was three months. The patient was a baby eighteen months of age. He was taken to Dr. V. P. Gibney, who recognized the condition at once and referred the child to me for treatment. The child had been treated for rheumatism for three months. All four extremities were swollen to twice or three times their natural size, and were swathed in bandages, each saturated with a different lotion or liniment. In this way each liniment was to be tested out and the one that served best was to be selected for all the limbs. The odors emanating from the child were those of a chemical establishment in active operation.

All previous local applications employed and those in use having failed, the case, with complete paralysis of all the extremities, was considered a suitable one for the orthopedist. In addition to the symptoms described, the gums were bleeding freely. In this child, the most severe case I have seen, the progress toward improvement was very slow. There was much extravasated blood to be absorbed, and infractions—how many I was not able to determine—to be healed. Resolution was, however, eventually complete.

Differential Diagnosis.—Scurvy in infants was formerly most frequently confused with rheumatism. The age for scurvy—under eighteen months—is not the age for rheumatism. Scurvy is a disease of early infancy, and rheumatism, a disease of childhood. In rheumatism fever is a usual symptom. In scurvy there is no fever. From poliomyelitis scurvy may be differentiated by the acute pain upon manipulation and the presence of the knee-jerk. Specific epiphysitis may be mistaken for scurvy if the upper extremity is involved. The absence of other signs of syphilis, and a negative Wassermann test, will render a differentiation possible. Further, in any case which is doubtful, the use of orange-juice will, in a few days, through relieving the symptoms of scurvy, determine the diagnosis. This is a perfectly innocent procedure upon any evidence of pain in any of the limbs.

Supposed trauma, such as a sprain or a fall, is the interpretation often applied to the symptoms of scurvy. Trauma in infants is most

unusual, but possible, and the treatment test, orange-juice, may be required to differentiate.

Treatment.—*Dietetic.*—The first step in the treatment is to supply fresh milk for the child, diluted, if necessary, to meet the digestive capacity. I have seen cases in which the diagnosis was made early recover without the aid of any other measure upon a change from sterilized milk or infant foods to raw milk. Inasmuch as the disease is a most painful one, every means possible should be employed toward furnishing early relief. If orange-juice is not well tolerated, beef-juice may be given, or the juice of any ripe fruit, suitably diluted. The orange-juice very exceptionally disagrees with the digestion. A scorbutic child who has never tasted orange-juice will take it greedily and beg for more. One teaspoonful may be given at two-hour intervals, 1 ounce being given ordinarily in twenty-four hours. Unless the case is an advanced one, with extensive subperiosteal hemorrhages and separation of the epiphyses, relief will be noticed in twenty-four hours and an entire cessation of symptoms in from five to seven days. I have seen a few cases entirely relieved at the end of seventy-two hours of treatment. These patients were infants in whom the diagnosis was made very early, the only symptom being the evidence of pain during manipulation of the limbs in bathing or while changing the napkin.

The management of more severe cases is the same as of those of milder type. Fresh food, with orange-juice or beef-juice, must be freely given. The patients should be handled very gently, and only when necessary, as the pain on manipulation of the involved parts is most excruciating. In cases of epiphyseal separation splints should be temporarily applied.

RACHITIS (RICKETS)

Rickets was described by Whistler in 1645, and again in 1650 by Glisson. The disease has been more wide-spread in countries with cool, temperate climates than in tropical or semitropical regions, where the inhabitants live for the most part out-of-doors. Similarly, this disease shows a slightly greater tendency to develop during the winter than in the summer. Attempts to define the exact etiology of the condition have uniformly failed. Most of the prevailing theories have been reviewed by Dr. R. G. Freeman,* who found the disease most frequent in institution babies who were fed on breast-milk supplemented by artificial feedings of condensed milk. In his opinion, both unsuitable food and infection or toxemia from the alimentary tract may be influential causes.

Siegert in 1903 expressed the view that rickets was often hereditary, supporting his belief by observations of severe cases in the breast-fed children of rachitic parents. By other authorities, however, rickets of congenital origin is held to be improbable or in any event exceedingly rare.

* "The Etiology of Rachitis," R. G. Freeman, Archives of Pediatrics, April, 1904.

Rickets is a chronic disease of nutrition. Its chief manifestations are in the bones during the growing period. It is peculiar, however, in that a greater part of the structure which goes to make up the infant organism may be involved in the rachitic process, which is in effect a metabolic derangement of wide possibilities.

Age.—Rickets may occur at any age after the first month. It usually makes its appearance between the third and the twelfth months. Few cases develop before the first month.

Etiology.—Italian and negro infants show a decided predisposition to rachitis. A negro or Italian baby between six and twelve months of age in New York city without some evidence of rachitis is a curiosity.

Much has been written regarding the etiology of the disease in its relation to climatic and unhygienic surroundings. While such surroundings may contribute to the result, I have yet to be convinced that as etiologic factors they are very important. It is true that we often find rachitic children in unhygienic surroundings, but thousands of others who live under the same conditions do not have rachitis. A child fed on normal breast-milk will endure and thrive in an environment that typifies "unhygienic conditions" (a popular term with writers).

In the treatment of several thousand rachitic children one fact has impressed me most strongly: A child suffering from rachitis is suffering from nutritional errors as a result of improper feeding or inability to assimilate a suitable food; and I have yet to see a case which will not improve when suitable nourishment can be given and assimilated, regardless of the age of the patient, provided, of course, there is no other disease. In children under one year of age prolonged feeding of the proprietary foods or sweetened condensed milk is the most frequent cause of the disease. The next most frequent cause is the feeding of a too strong cow's-milk mixture, which produces indigestion and faulty assimilation.

Rachitis in the Breast-fed.—Breast-fed babies among the Italians and negroes often have mild rachitis, and an examination of the breast-milk will invariably show a diminution of one or more of the nutritional elements—usually the proteid.

A nursing woman in the New York Infant Asylum had such a free flow of milk that a foster-child was given her to nurse. The children failed to thrive; each made a gain of but two or three ounces weekly; both developed rachitis, one in a marked degree. Repeated examinations of the breast-milk showed it never to contain more than 1.5 per cent. fat, 4 per cent. sugar, and 0.5 per cent. proteid.

I have time and again seen rachitis in breast-fed infants in whom the milk was adequate in amount, but deficient in nutritional elements. These cases will most often be seen from the seventh to the tenth month.

After the First Year.—After the first year fewer cases develop, but a late rachitis is by no means uncommon. In my own cases the development of the disease at one year and after, as in the very young, has been distinctly traceable to faulty feeding and faulty digestion.

Prolonged Nursing.—Not a few cases during the second and third

years are due to prolonged nursing. I have known just two mothers who could nurse their children, and substantially nourish them, by the breast, later than the twelfth month. Usually when the breast furnishes the only means of nourishment after the ninth month, a beginning rachitis will soon be noticed. The feeding after the first year of an exclusive diet of milk or of indigestible starches is not infrequently a cause of rachitis. Among the poorer classes children during the second and third years are almost always badly fed. The diet often consists of poor milk and poorly cooked starches. Children thus fed furnish no small proportion of our rachitic patients.

Association With Other Diseases.—The development of rachitis bears no relation to other disorders, excepting in its influence upon the nutrition of the patient.

Theories of Pathogenesis.—Deficiency of lime salts in the system, either as the result of poor food or faulty assimilation, has been long regarded as the cause of the disease, but investigation has proved that rachitic subjects do not present the supposed variations from the normal, either in alkalinity of the blood or in lime elimination.

Experiments in depriving young animals of fat have failed to render them rachitic. Attempts at bacterial inoculation have likewise afforded no convincing results.

Monti, of Vienna, was able to demonstrate a diminution in hydrochloric acid associated with an excess of lactic acid in the stomachs of affected infants, and he coupled with this discovery the observation that the disease was more prevalent among the breast-fed infants of Saxony, whose mothers received little salt in their food, than in communities where the individual intake of sodium chlorid was normal.

Recently, Hirschfeld has demonstrated the existence of a vasoconstrictor substance in the serum of rachitic infants. To the presence of this substance he ascribes the frequent coexistence of simple rickets with tetany, eczema, and such catarrhal conditions of the mucous membranes as are indicative of a so-called exudative diathesis.

In the state of confusion arising from so many diverse theories we may summarize the results of clinical evidence in only a few facts: Rickets is infrequent in the breast-fed, unless colored or Italian; relatively infrequent amid good hygienic surroundings; rare before the age of three or four months, and uniformly absent from infants who have been taking and assimilating a substantial, well-proportioned food.

Pathology.—The most obvious changes are in the bones. Here there is indeed a marked deficiency of lime salts. The formation of bone is interfered with not only at the epiphyses, but also in the region subjacent to the enveloping periosteum.

In the epiphyseal ends of the long bones there is an excessive proliferation of the cartilage cells, and an abnormal vascularization of the zones of proliferation and calcification, which intervene between epiphysis and diaphysis. The deposit of lime salts in the cartilaginous matrix is imperfect, and the solid cartilage undergoes a variable amount

of absorption. As a result of these changes the epiphyses are softened and enlarged and the bones are subjected to varying deformities.

Associated with the defective development at the epiphysis there is likewise incomplete formation of bone beneath the periosteum. This membrane is thickened, and the subperiosteal layer of bone, which normally undergoes calcification, is vascularized, soft, and deficient in calcium salts.

"The pathologic changes may be summed up in the statement that there is excessive absorption of the bone with impairment of the process of calcification."* When the disease subsides, the imperfect bone undergoes calcification and hardening, but retains the deformities previously acquired. The enlargement of the epiphysis characteristic of rickets is usually first apparent at the costochondral joints, which acquire the well-known beaded appearance suggestive of the title, "*rachitic rosary.*" In the more advanced cases the thorax undergoes actual distortions, defined by the terms, "*Harrison's grooves*" and "*pigeon-breast.*" Curvatures of the spine and pelvic deformities which may be combined with lordosis are common. In severe cases the legs become curved, owing to the inability of the bones to sustain the weight of the body, and portions of the cranial vault may undergo a variable amount of absorption. Localized areas of thinness in the occipital and parietal bones are characteristic of the *craniotabes* of rickets. The affected skull is large and the centers of ossification of the frontal and parietal bones are marked by hyperostoses or bosses. In many instances the anterior fontanel, instead of becoming closed at the twentieth month, remains patent until the third or fourth year. The eruption of the teeth is uniformly delayed.

Although rickets is fundamentally a disease of general nutrition, the lesions, apart from those occurring in the osseous system, are of relatively slight significance. The spleen is frequently enlarged; less often, the liver. The stomach and colon may be dilated. The muscles undergo wasting, slight degenerative changes, and a variable amount of fatty infiltration. The ligaments are relaxed. The blood shows the existence of a secondary anemia and a mononuclear leukocytosis. Most of these conditions may, however, be considered secondary to, rather than characteristic of, the disease.

Symptoms.—In a vast majority of the cases there are no symptoms depending upon the presence of the disease. There may be sweating of the head, restlessness, constipation; but these symptoms are also present in cases which show no rachitic change. There is usually malnutrition, and yet malnutrition may be present without rachitis. Rachitic children are unusually susceptible to catarrhal conditions of the respiratory tract and they have a weak resistance to infection of the intestines; yet, again, we find these conditions in children who do not have rachitis. In rachitic children there is pronounced lack of nerve balance, and this occurs in children who do not have rachitis. All these conditions are present in rickets, and as a symptom-complex they point

* Adami and Nicholls: Principles of Pathology, vol. ii, p. 1009.

to rachitis. Such symptoms, therefore, are not diagnostic without further corroboration.

So far as the pathognomonic symptoms are concerned, which means the conclusive manifestations of a disease, there are none.

The signs proving rachitis comprise the physical appearance of the child, the findings upon physical examination, and the evidence demonstrated by postmortem examinations.

Diagnosis.—In a well-marked case inspection shows a condition that is seen in no other disease. There is the large head, cuboid in shape, flat on the top, due somewhat to the exaggeration of the frontal and parietal eminences. The beading of the ribs stands out plainly. The chest is narrow, retracted at the sides, and increased in the anteroposterior diameter, producing the so-called pigeon-breast. In pronounced cases there often is an axillary groove extending the length of the chest. A rare deformity is the funnel-chest, in which there is a marked retraction of the lower portion of the sternum, greatly decreasing the anteroposterior diameter at this point, with a corresponding increase in the lateral diameter.

The epiphyses of both the upper and lower extremities are enlarged, and there is a decided outward curvature of the tibia. There may also be anterior bowing of the femur. The radius and ulna may also show curvature, but this is less usual. Knock-knee is present in a comparatively small number of cases.

The child has a pot-belly, often with umbilical hernia.

Physical examination reveals a large fontanel, two or three times the size normal for the age. Dentition is delayed; repeatedly infants of a year and over will not have erupted a tooth. Craniotabes, which consists of soft, compressible areas in the skull showing deficient deposit of bone-cells, is present in many young rachitic infants.

A non-angular posterior spinal curvature involving several vertebræ will be found in a majority of the patients under fifteen months of age. This is due to muscle and ligament weakness, and will be proved by suspending the child by the arms, when the curvature will usually disappear. This straightening may not completely take place in older children, in whom the deformity has existed for several months. Further, in older cases there may be associated lateral and rotatory curvatures.

The clavicle may show thickening at the ends, and in severe cases I have repeatedly seen an increase in the anterior curve.

In a large out-patient and hospital service extending over many years in different institutions all types of deformities have been presented, an enumeration or description of which would add nothing.

Rachitic children will be found abnormal in other respects. There is usually a secondary anemia. They possess poor resistance to bacterial infection, and when such infection, or in fact any disease, occurs the chances of recovery are less than in a normal individual. The nerve resources are of a low order. Convulsions may occur upon slight irritation. The digestion is rarely up to the normal for the child's age.

It is to be understood that in this description I have been considering a well-marked case. Hundreds of children show varying degrees of mild rachitis in which the conditions may in no way compromise the individual. Further, it must be appreciated that not every case shows the even distribution of the lesions enumerated. There may be cases with bowed legs or knock-knees, spinal deformity, or enlarged cranium, in which one of the conditions mentioned may be the only sign of consequence.

Differential Diagnosis.—That confusion arises in differentiating rachitis from cretinism, mongolianism, and hydrocephalus is demonstrated in consultation practice. A clear mental picture as to what constitutes mongolianism, cretinism, and rachitis would eliminate confusion without the assistance of a consultant. A differentiation, however, between the large, rachitic head and one due to an acquired hydrocephalus or to a mild degree of congenital hydrocephalus is not a simple matter, for the reason that when there is hydrocephalus there is usually rachitis. An immediate diagnosis is impossible. I have known most competent neurologists to ask for time for further observation before making a diagnosis. The further observation has usually included repeated measurement of the circumference of the child's head. A child's head increases in circumference from birth onward about as follows: During the first year, 4 inches, 3 inches of which is increase during the first six months; during the first and second year, 1 inch; during the second to the third year, ½ to ¾ inch; during the third to the fifth year, 1¼ inches. When the rate of growth considerably exceeds these figures, it is an indication of a hydrocephalus. A prominent fontanel and ununited sutures indicate hydrocephalus. (See p. 493.)

Prognosis.—The prognosis is favorable in so far as the immediate disease is concerned. Uncomplicated with intercurrent disease, all cases recover if properly treated. Indirectly, because of the susceptibility to infection and the lack of resistance, rachitis is a large factor in the mortality of the young. Cured patients suffer no inconvenience in later life. There is doubtless some shortening in stature; it is difficult to determine the effects in this respect, as there are no means of knowing what height the individual might have attained had he not had rachitis. In women at childbirth its baneful possibilities are made prominent in narrow and contracted pelves.

Treatment.—It will readily be seen, from the foregoing, that the treatment of rachitis resolves itself into the adjustment of the diet to the needs of the patient. As growth and normal development cannot take place without proteid and salts, and as the history of our cases has shown that these are the elements which are most frequently lacking in the diet of rachitic children, suitable feeding should be our first consideration.

Diet of Infants.—Artificial foods usually are deficient in both the fat and proteid; therefore these foods should be discontinued. I have seen a vast number of cases that were on cow's-milk feeding of

such strength that it could not be assimilated. In practically all cases a properly adapted cow's-milk formula is the only treatment required.

Diet After the First Year.—For those over one year of age not only should artificial food be discontinued and cow's milk given, but the cow's milk should be supplemented by a diet rich in nitrogen. I order a diet composed largely of milk, scraped beef, soft-boiled egg, oatmeal, and wheat gruel. After the second year purées of beans and peas are added to the dietary because of the large percentage of proteid which they contain. It is impossible to prescribe a more definite dietary. The physician must remember that a diet as highly nitrogenous as the child can assimilate is to be given. Unfortunately, many rachitic children cannot take cow's milk in quantities sufficient to make it of real nutritive value. This is often the result of an inability to digest the fat, the milk being taken without inconvenience when a large proportion of the fat is removed. Skimmed milk contains at least 3 per cent. of the nutritional element most desired, the proteid, and makes a valuable addition to the diet. If a dilution of the milk is necessary, oatmeal gruel should be used.

Many children who cannot take a full milk diet will take an ounce or two of butter daily without inconvenience. For older children I advise the free use of butter, one or two ounces daily. It is advisable to give rachitic children a moderate amount of fat, as it aids in the production of heat and thus saves the tissues. Before the second year of age cod-liver oil is often a valuable addition to the dietary. In prescribing cod-liver oil I prefer to use the plain oil. In spite of the disgust adults have for cod-liver oil, children usually take it readily. The younger the child, the better the oil will be taken. To delicate children six months of age from 10 to 30 drops may be given three times daily after meals. From the sixth to the eighteenth month, from 20 drops to 1 dram may be given three times daily after feedings. After the eighteenth month, from 1 to 3 drams may be given three times daily after meals.

Hygiene.—Brine baths and oil inunctions aid materially and are of great value in improving the child's condition as a whole. The brine bath (p. 750), which is given at bedtime, is followed by an inunction of goose-grease, unsalted lard, or cacao-butter. The goose-oil or lard is preferred. At least two teaspoonfuls should be rubbed into the skin. The benefit derived from the inunctions is largely due to the massage. The rubbing should be continued for at least ten minutes. The muscles of the back and legs should receive special attention. In a few instances the animal fats act as irritants to the skin and produce a fine, papular eruption.

The rachitic child should have plenty of fresh air, by means either of a fireplace or an open window. On stormy and very cold days he should be given an indoor airing (p. 732), being placed in his carriage or cart and wheeled about the room. To avoid drafts, the window or windows on only one side of the room should be opened.

Rachitic children are very susceptible to head colds and bronchitis;

therefore, every means must be employed to prevent exposure. As creeping and playing on the floor are the most frequent methods of taking cold, the exercise pen (p. 737) is particularly useful in these cases.

Drugs.—Drugs, in my experience, are of value only as they increase the appetite and the capacity for properly selected foods. The administration of phosphorus is without avail if the deficient diet is continued. Specific medication without proper food and a fair digestive capacity is valueless. With proper food and a fair digestive capacity, medication is superfluous, and a child rapidly recovers without it.

I have used phosphorus extensively, and have yet to see a single case in which the beneficial action of the drug could be proved. In giving phosphorus, the oleum phosphoratum is the easiest and most convenient form for administration. One drop of the preparation represents $\frac{1}{100}$ grain of phosphorus. To children under one year of age 1 drop may be given three times daily. To those between the first and second year, 1½ to 2 drops may be given three times daily after meals.

Deformities.—The deformities of the osseous system, particularly of the spine and long bones, may be prevented—the first, by keeping the child on his back a greater part of the time, and, if the deformity is well marked, by teaching him to sleep resting on his stomach. When a kyphosis is present, the child should be allowed to remain in the upright position but a few moments at a time.

Deformities of the femur, tibia, and fibula occur long before the child attempts to stand, but too early use of the legs, while not necessarily a cause of deformity, may greatly aggravate the existing conditions. For this reason rachitic children should not be encouraged to walk or stand until they have been under treatment for three or four months.

Operative measures for the correction of bow-legs are better postponed until after the third year. If corrected at an earlier period, the deformity is apt to return, and the late deformity may be greater than the original one.

In my experience the use of the braces to correct the deformity of the legs has been of but little assistance, nor has any patient of mine been benefited particularly when so treated by the orthopedic surgeon. The use of braces and jackets of plaster-of-Paris in kyphosis is usually unnecessary. Rest, massage, and exercises directed to restoring power to the weakened muscles have answered well.

THE DELICATE CHILD

In pediatric practice one frequently meets with children who, while they cannot be said to be suffering from any disease or pathologic condition, yet are inferior in physical development. They lack endurance, and possess poor resisting powers. They are usually under height, always under weight, and, in short, have so many characteristics in common that they constitute a class by themselves, and as such warrant our attention.

Normal Development.—The average child, at the various periods of

early life, conforms with a certain degree of regularity to the mental and physical development which by long association we have come to regard as normal. Thus a standard may be said to have been established, and it is up to this standard that we expect the growing child to measure. This is what we look upon as the average of physical and mental development. A few children exceed these requirements and are stronger and larger at the sixth month than the average child at the ninth month. Again, older children at the fourth or fifth year may be in every way equal to their normal playmates a year or two older.

Abnormal Development.—On the other hand, there are children who are born with reduced vitality, or who, through faulty management, usually in relation to feeding, acquire a reduced vitality. Semi-invalid adults almost invariably beget semi-invalid children. If the parents are of average health and of good habits and the debilitated condition of the child is due to faulty management and nutritional errors, the result of proper dietetic and hygienic management is usually prompt and satisfactory. With the persistently delicate, the offspring of physically enfeebled parents, the results are less satisfactory.

Treatment.—By proper regulation of the habits of a delicate child, as regards all the details of his daily life, a far better adult is produced than if no such effort has been made. In other words, a diet and general régime of life best adapted to the individual in question will invariably improve the physical condition of that individual. This applies to the strong as well as to the delicate, to the growing young of the lower animals as well as to the offspring of man. It is the poorly developed, delicate child that we are particularly to consider—the undersized, frail, small-boned child, whose appetite is persistently poor or capricious, who sleeps poorly, tires easily, is usually constipated, who is subject to catarrhal conditions of the respiratory tract, and whose powers of resistance generally are diminished.

On assuming the management of one of these children it is absolutely necessary to make a thorough examination, followed in some instances by a few weeks' observation, in order to become acquainted with the case in its individual aspects, to learn idiosyncrasies, and to eliminate the factor of actual disease as a causative agent. When we demonstrate to our satisfaction that the child is free from such diseases as tuberculosis, syphilis, and malaria; when we have eliminated by properly directed treatment all causes, such as adenoids, phimosis, adherent clitoris, vaginitis, or parasitic and irritant skin lesions, which may have had a deterrent influence upon growth; and when we have satisfied ourselves as to the actual condition of our patient, we are in a position to lay down definite rules of management.

Every child has a distinct function to perform. As soon as he is born he is confronted with a serious problem—the problem of physical and mental growth. Inasmuch as this growth and development depend, above all things, upon a properly adapted food-supply, it must be our first step to provide such nutriment as will be most conducive to growth. As growth takes place in all parts of the body through cellular activity, the

nutritive elements which support cell proliferation must be important constituents of the diet, and among these the proteids are of prime importance; hence in the management of these children a point to be remembered in the adaptation of the food is the necessity of feeding as rich a proteid as the child can assimilate. The younger the child, the greater the necessity for growth.

Regular Weighings Necessary.—An infant should be weighed at regular intervals, and if under one year of age, should not be considered as doing even passably well if not gaining at least four ounces weekly. When a baby remains stationary in weight, the development is invariably abnormal. When the weight is stationary or when only a slight gain of one or two ounces weekly is made, we always find after a few weeks that there is malnutrition, in spite of the apparent gain, as will be evidenced by the symptoms of beginning rickets—anemia, the characteristic bone changes, flabby muscles, and a tendency to disease of the mucous membranes. Delicate infants should be weighed daily at first; then, as improvement takes place, at intervals of two or more days, but never less frequently than once a week, during the first year, no matter how vigorous they may become. The weighing keeps us directly in touch with the child's condition, but since the increase may be in fat alone, an occasional examination of the child stripped is necessary to tell us whether there is substantial growth in bone and muscle.

Feeding Infants.—When it is demonstrated that a child will not thrive on the breast of the mother, another breast should be substituted, or an adapted high-proteid cow's milk should supplement or replace the breast milk. If the child is bottle-fed and it is demonstrated that proper growth and development are impossible on cow's milk, on account of proteid incapacity, then a wet-nurse should be secured.

When, after the first year, more liberal feeding is allowed, the necessity for a high proteid in the food selected is as urgent as before. This applies to those children who are brought to us showing evidences of late malnutrition, as well as to those whom we have had under our care from early infancy.

An important element in the diet up to the third year is milk. A child from the first to the third year ought to receive one quart of milk daily. Unfortunately, many debilitated children have a very poor capacity for fat assimilation. When given full milk in as small an amount as one pint daily, they often develop foul breath, coated tongue, and loss of appetite, or they suffer from frequent attacks of acute indigestion. The milk is necessary, not because of the fat, which can easily be dispensed with, but because of the high percentage of proteid which it contains—from 3 to 4 per cent. When this fat incapacity exists, the milk is said to "disagree," although skimmed milk will be taken without inconvenience. Enough sugar may be added to bring the percentage up to seven, in order that the extra sugar may replace the fat for fuel. Skimmed milk with sugar added furnishes a food of no mean order. Too much milk, however, must not be given. When more than one quart daily

is taken, the desire for more substantial nourishment, such as eggs, meat, and cereals, is removed.

Diet After the First Year.—At the completion of the first year, keeping in mind a high proteid we may give scraped beef, at first one teaspoonful once a day, in addition to the cereal and milk. If the beef is well borne, and it usually is, a teaspoonful may be given twice a day, and later three times a day, immediately before the bottle-feeding. Eggs should be brought into use from the twelfth to the fifteenth month. At first one-half an egg, boiled two minutes, is given mixed with bread-crumbs. If well borne, a whole egg may be allowed. The cereals used should be those richest in vegetable proteid, such as oatmeal, containing 16 per cent. of proteid, dried peas, with 20 per cent. of proteid, and dried beans, containing 24 per cent. of proteid. The peas, beans, and lentils should be given in the form of a purée.

If the child during the second year has an indifferent appetite, the quantity of milk should be reduced, never more than one pint of skimmed milk being permitted daily for the first week or two. Many delicate children who apply for treatment after the first year of age have been subjected to as grave errors in diet as are seen among the bottle-fed. Starch and milk frequently furnish the only nutrition up to the fourth or fifth year, the starch used being generally in the form of bread, crackers, and ill-cooked cereals. In one case four quarts of milk were taken daily by a boy of seven years.

In dealing with this class of children—the delicate, undersized, slow-growing class—it is our aim to give as liberal nitrogenous nourishment as is compatible with the digestive capacity of the patient. If, however, the child has had rheumatism, or if there is a tendency to lithiasis, the use of a large amount of meat is contraindicated. For such children the high-proteid cereals are particularly valuable. In general, from early life the diet of the delicate child should consist of milk, suitably adapted, with highly nitrogenous cereals added when permissible. Many delicate children of the "runabout" age who cannot digest milk containing 4 per cent. of fat will easily digest butter-fat spread on bread or potatoes. In this way I often use butter to supply fuel to act as a proteid-sparer. Oatmeal-water, or oatmeal jelly, mixed with the milk should be ordered at the seventh month. When age allows, the addition of rare meat, poultry, eggs, and purées of dried peas, beans, and lentils should be made. Boxed, "ready to serve" cereals are never given; raw cereals are provided which are cooked three hours. While a high-proteid diet is desirable, other foods are necessary. Green vegetables, animal fats, the ordinary cereals, cooked and raw fruits, are required to furnish the necessary acids and salts, as well as the necessary variety. In short, the ideal diet for a delicate child is that combination of foods which, while imposing the least burden upon the digestive organs, supplies the body with material sufficient for its needs. (See dietary, p. 97.)

Baths.—On account of the fear that a delicate child may take cold, the bath is often omitted. All children, both the well and the delicate, after the second week should be tubbed daily; the delicate particularly

require bathing. The salt bath (p. 750) is usually advised. The best time for giving the bath is at bedtime, and in order to avoid all chance of exposure the temperature of the room should be elevated to 80° F. The temperature of the water may vary. It should never be above 95° F. except for very delicate young children in whom there is a tendency to a subnormal temperature. Even in these cases the temperature of the bath should never be higher than the temperature of the body. For the frail and the very young, the bath should not be continued over five minutes. In bathing children of eighteen months or over, if the physical conditions allow, a distinct advantage will be gained by a reduction of the temperature of the bath while the child is in the water. An immersion in water at 90° F., followed by a gradual reduction during the space of five or six minutes to 70° F., should, upon brisk rubbing, be followed by quick reaction. For children after the third year, a graduated cold spinal douche has served me well. (See Spinal Douche, p. 749.) If the reaction is not good, if the extremities are cold and are slow in becoming warm, the reduction in the temperature should be less or none at all. With the very poorly nourished, a reduction below 80° F. should not be attempted. Following the drying process, primarily for the benefit of the massage, goose oil, unsalted lard or olive oil should be rubbed into the skin over the entire body for five to ten minutes. The bath and massage inunction, besides favorably influencing nutrition, are very effective in inducing sleep.

Fresh Air.—Delicate children are usually deprived of a proper amount of fresh air, for the same reason that they are insufficiently bathed—the fear of making them ill. All children need an abundance of fresh air both in illness and in health. To the delicate fresh air is even more essential than to the robust. As many hours daily as practicable should be spent out-of-doors. The time thus spent depends upon the season of the year and the residence of the child, whether in the city or the country. In the city, during the colder months with pleasant weather, the child should spend at least five hours daily in the open air, dividing the day into two outing periods—from 9 to 11.30 in the morning and from 2 to 4.30 in the afternoon. On very cold days (20° F. or below), on stormy days, and on days with very high winds, the child should be given his airing indoors. He is dressed as for out-of-doors, placed in his carriage, and left in a room, the windows on one side of which are open. Not infrequently during February and March delicate children will be prevented from going out-of-doors for several consecutive days. If some means for a daily systematic indoor airing is not provided, these children will often go backward, no matter how excellent the other management. The first symptoms are loss of appetite and the ability to assimilate food. In my private work among athreptics, the child is placed in the baby-carriage or in a basket and allowed to rest before an open window for ten or twelve hours of every twenty-four, with a hot-water bottle at his feet. Here he is fed, being removed only temporarily to warmer quarters for a change of napkins. I have three roof-gardens in operation. A boy patient, nine months of

age, was taken to the street only once in four months, then only going to church to be baptized.

Sleep.—The delicate child requires no more sleep than does the strong, and the rules governing this function at the various periods of life are the same both for the strong and for the weak. (See Sleep, p. 47.) The sleeping-room of the delicate child should always communicate with the open air by a window, either directly or through an adjoining room. A satisfactory means of ventilation is the window-board (p. 150). The child should occupy the room alone, if possible, sharing it neither with an adult nor another child. This ruling applies to all ages, but is particularly necessary after the second year.

The Nursery.—The temperature of the nursery, day or night, should never be above 70° F. during the colder months. Very young infants, and those who are with difficulty kept covered, should not sleep in air below 65° F.

Delicate children of the "runabout" age are very susceptible to colds. In the management of such children it is necessary to use every precaution against exposure. The most frequent way of exposing a child to cold is by allowing him to sit on the floor. To keep the child of ten months to three years of age off the floor during the winter months, and thereby to eliminate this means of exposure, is very difficult. In fact, with active children learning to walk, or who have just learned to walk, it is practically impossible under the usual conditions. During the colder months there is always a current of cold air near the floor, and allowing the child to creep in winter, even if the floor is protected by rugs and carpets, is one of the surest ways of permitting him to take cold. If he is allowed to walk on the floor, he is very sure soon to sit down. If he is not allowed to creep and walk about at will, he will not get the proper exercise and will show faulty development. For such cases, I have found the exercise pen of immense service. (See p. 737.) After being dressed, washed, and fed, the child is placed in the pen, on a rug if desired. Toys are given him and the door is closed. He can now roam about at will, stand up, sit down, creep or walk without the slightest danger from drafts.

Influence of Climate.—Much has been written regarding the influence of climate in the type of case we are considering. According to my observation, this matter does not deserve the attention it has received. The city child in a well-to-do family is, as a rule, better off for eight months of the year in his own home with its usual conveniences. The benefits attributed to change in climate are usually the result of a change not of climate, but to more fresh air, which is afforded by the larger rooms of the hotel, with its loosely constructed doors and windows; and the fact that, since the parent is desirous that the child shall receive the full benefit of the change, he is kept in the open air for a much longer time than when at home. The air at such a place is more expensive, and consequently more appreciated than the air at home. With sufficient heat and proper ventilation, we may make our own climate. It is not to be denied, however, that a change of residence

for a few weeks, during March and April, from New York to Lakewood or Atlantic City, is sometimes of advantage.

From the first of June to the first of October the delicate child should not remain in any large city if removal is possible. The humidity and the heat which may prevail for protracted periods during this time render the city unsafe, particularly during July and August. The seashore for the entire summer is not to be advised. The children whom I have sent inland to the country and to the mountains have, as a rule, returned in the autumn in much better physical condition than those who spend the summer by the sea.

Clothing.—Thin, poorly nourished children require more clothing than do those physically normal. A fairly good index as to whether a child is sufficiently clad is the condition of his lower extremities. The forearm and hand cannot be relied upon. The legs and feet of every child should always be warm to the touch.

As clothing, a mixture of silk and wool next to the skin is most desirable. Although less desirable, a mixture of wool and cotton may be used. The linen mesh, often useful for the vigorous "runabout," is not to be advised for the delicate.

Exercise.—Exercise is to be encouraged, but should never be allowed to the point of fatigue. In large cities all delicate "runabouts" from three to five years of age should be allowed to walk not more than six blocks in going to the playgrounds. If the distance is greater, the child should ride part of the way, play or walk for a time, and then be placed in the carriage or cart and ride home. Younger children, two or three years of age, should be wheeled both ways and taken out at the park for a run when the weather conditions permit.

Midday Nap.—Every day after the midday meal the child, regardless of age, whether two years or six, should be undressed and put to bed for two hours. He should be left alone in the room, and whether he sleeps or not he should remain in bed for the two hours.

Entertainment.—Entertaining play is necessary, but every kind of excitement, such as children's parties, emotional plays at the theater, and rough play with older children, should be avoided.

Education.—The delicate child under eight years of age should be taught only to the extent of strict obedience and good habits. In other respects he should be a little animal. There should be no teaching in the ordinary sense of the term, no mental stimulation, until the child is physically able to bear it. When school-work begins, which in this class of children should never be before the eighth year, the studies should be made easy and the school-hours short. Such children should never be crowded. I usually direct that they attend only the morning session.

The delicate child should be carefully watched from the time he comes into our hands until he reaches the normal, or until the period of development is completed. While the management as outlined will not always be attended with brilliant results, it will not be in vain. Many lives will be saved, and as a result of the increased reistance, stronger men and women will be added to the race.

Now and then I meet with a case among the well-to-do in which, because of prolonged faulty feeding or vicious heredity, the vital spark is so low that, fan it as we may, no impression upon it is made. As a rule, these stubborn cases are the offspring of alcoholism and debauchery. The patients are thin, anemic infants; they develop into thin, anemic children, and into thin, anemic adults. The delicate and degenerate are found in all the walks of life, but they are especially numerous in dispensaries and in children's institutions.

Much of the work of the pediatrist is with the weakly of the so-called "better class." His success in the management of these delicate children depends largely upon the home coöperation, and a promise of this should be obtained before taking the case. The parents must be taught that the development of the intellect, the character, and the body go hand in hand and that a vigorous intellect is rarely found without a vigorous body. They must be convinced that the body is more than a machine. It has delicate organs to keep in repair and supply with energy. It has a nervous organization; it has sensibilities. The normal exercise of all these functions demands the normal nourishment of the body. In my experience, family coöperation in a few instances has been difficult to obtain. The parents began well, but soon tired of the extra work required. The care of the young has always been undertaken in such a wretched, unscientific manner that it is difficult to make the untrained mind appreciate the necessity of careful attention to details in management.

The Child vs. the Animal.—It is a startling fact that 75 per cent. of all children do not get as scientific care and attention, as regards the selection of food, housing, and exercise, as do the calves and colts, the lambs and pigs, of any high-class stock-farm. Is this because the child has no market value in dollars and cents? In France, during the past few years, this defect in the people as a whole has received governmental attention; and on account of the diminished birth-rate, the value of a human life is beginning to be appreciated. That the subject of better care of the young deserves our earnest consideration is well illustrated by the statement recently made in the House of Commons, by Sir William Anson, Parliamentary Secretary of the Board of Educators, that sixty thousand of the children attending the London schools were physically unfit for instruction. The Adjutant-General of the English Army Medical Service has reported that one man in every three offered recruits ought to be rejected.

II. EXAMINATION AND DIAGNOSIS—CARE OF ACUTE ILLNESS

DIAGNOSIS

Before a student in diseases of children is shown a sick child, he should be made thoroughly familiar with the normal child of approximately the following ages: under three months, one year, three years, five years, and ten years.

He should learn the normal appearance of the eyes, ears, throat, skin, genitals, and the character of the stools of the various ages. He should be instructed in the examination of the liver, spleen, abdomen, heart, and lungs.

In teaching diagnosis in children in postgraduate work, covering a period of twenty years, I have repeatedly been impressed with the handicap under which many physicians work because of a very indifferent conception of the normal.

Without sufficient ability to examine the canal and drum of the ear, and to know the possibilities for variations within the normal, it is futile to attempt the recognition of diseased processes.

Many physicians expert in pulmonary diagnosis in adults are wholly unable to make out even approximately diseased conditions in the lungs of infants and young children. These are all conditions that cannot be taught in a didactic way. Neither can one learn much of the subject through reading. What is required is the examination of the normal infant or young child—not a few examinations, but a very careful routine examination of many infants and young children. A point most difficult to determine is the borderland between normal and diseased processes, as evidenced by physical signs.

Diagnosis in children requires ability to estimate the condition as a whole. The fact that the patient cannot describe his symptoms is of more advantage than detriment. The child appears in the perfectly natural condition, without attempt to mislead, with no preconceived ideas or theories. In other words, the child, unless alarmed, is always natural, always himself; this is a very definite aid. Further, the young child has no imagination. He is never hypochondriac. Instead of giving the impression that he is more ill, he is liable to be judged less ill, than he really is, because of his activities and disinclination to give up. This tendency to remain active may be misleading. When, therefore, a child appears very ill, while the condition may not be dangerous, we may always know that he feels very badly.

Physicians who wish to become expert in diagnosis must first learn the *normal* child from birth until he passes into the adult.

Diagnosis by Inspection

We must learn the appearance and bodily habit of the child under normal conditions. Thus the baby of a few weeks cries when hungry,

and with incoördinate movements of the arms and legs expresses his discomfort. With colic or pain of any nature he also cries, and with incoördinate movements of hand and legs makes known his discomfort. But the child's manner of crying and the movements of the body are in no way alike. A baby spoiled and who wants to be taken up also makes a great ado, and yet he acts vastly different than when he is in hunger or pain.

All the above manifestations are vastly different from the cry and the arhythmic movements of early meningitis.

The position in which the child rests in bed often supplies us with very good evidence as to the nature of the trouble. Thus one position is assumed in meningitis; another in paraplegia; and another in scurvy or poliomyelitis. The countenance or the facial expression may be indicative of the disorder. The anxious, flushed countenance of acute pneumonia, with the dilatation of the alæ nasi and the rapid breathing and grunt, are all strongly suggestive. The sunken eyes, the expressionless countenance, the ashy pallor, the superficial breathing, all characterize the appearance of the patient with intestinal toxemia.

The diagnosis of malnutrition and marasmus is always stamped on the countenance. In cretinism, in Mongolian idiocy, in microcephaly and other forms of mental deficiency, the name of the disorder is written on each countenance, and for diagnosis we need go little further.

The blue-white skin of anemia, the pallor of nephritis, with the fulness about the eyes, are often diagnostic in themselves. Among the transmissible diseases, measles, mumps, and chicken-pox, all are readily diagnosed by inspection. In scarlet fever, also, inspection is our greatest aid.

In hemiplegia the quiet arm and leg, with the other arm and leg in motion, are strongly suggestive as to the nature of the trouble.

The only way in which whooping-cough may be positively diagnosed is to watch the child during a paroxysm.

By inspection we can fairly accurately determine the existence of acute laryngitis or membranous laryngitis. As mentioned elsewhere, the obstruction in acute laryngitis is inspiratory, while in membranous laryngitis it is both expiratory and inspiratory.

The position of the head, the dysphagia, and the peculiar cracked voice mark retropharyngeal abscess. The method or peculiarities of locomotion supply most valuable evidences of Pott's, hip or other bone and joint diseases. In tetany, the "accoucheur's" hand, and the feet in extreme extension, are all that are necessary for diagnosis.

The yellow conjunctivæ and the tinted skin indicate jaundice. In the skin diseases or skin manifestations of any nature inspection again is an important means of diagnosis.

The facial expression due to adenoids is so characteristic that every text-book contains a photograph demonstrating the "adenoid face."

Laryngismus stridulus, convulsions, tonsillitis, rachitis, scurvy, and stomatitis are all diagnosed by inspection.

It will readily be seen what a great aid in diagnosis is possessed by the physician who possesses trained powers of observation.

Inspection During Sleep.—It is of advantage to observe many children when they are asleep, and beyond all the influences of their surroundings. In not a few cases correct respiratory observations are possible only when the child is asleep.

FIRST EXAMINATION

Upon being called upon for the first time to see a patient, it is my custom in every case to take a history. Below is a copy of the history record which I use. Form A represents the front of the slip. Form B represents the back of the same slip. Further records are kept on plain ruled sheets of the same size—5 by 8 inches.

HISTORY RECORD

FORM A

Date Address Name
Mr. Age
Family History Children living Ch. dead Cause
Rheumatism Tuberculosis Syphilis
Nervous Dis. Alcohol, tea, etc. Miscarriages
Personal History child, born at Labor Wt. at B. lb.
Sat up at mo. Talked at mo. Teeth at mo. Walked at mo.
General Health and Habits
Appetite Eats between meals? Tea, beer, etc.?
Bowels Bath Fresh air
Sleeps from ro ; and from to . Snores? Mouth Br.?
Previous Diseases Meas. Wh. Cg. C-Pox Scarlat. Diphth.
Mumps. Sm-Pox.
Gastro-enteric
Respiratory
Ear Throat Colds
Diet from Birth Nursed
Present History

FORM B

EXAMINATION

Weight lb. Height in. Circ. Head in. Circ. Chest in.
General Condition Color Muscles Reflexes
Mentality Sits? Walks? Talks?
Head Fontanel Sutures Cranio-tabes
Eyes **Nose** Disc. Breathing
Mouth Tongue Muc. Memb. Teeth
Throat Tonsil Adenoids
Lymph Nodes Ears Epitrochlears
Thorax Shape Rosary Groove
Heart
Lungs
Abdomen Umbilicus Liver Spleen
Genitals **Skin**
Extremities Epiphyses Contour Feet
°.P. .R . **Blood** R.B.C. Hb. %. W.B.C.
Urine React. S. G. Alb. S. Ind Mic. Exam.

When the history is completed, the leaves are placed in a Moore's loose-leaf binder.

The patient's family history is carefully taken. The habit of obtaining a complete and accurate record of family peculiarities in relation to disease is often of much service, subsequently, if not at the time. Only upon systematic questioning will necessary facts be brought out relating to tuberculosis, rheumatism, syphilis, etc. The child's personal history includes the birth-weight, the rate of growth, the nature of previous illnesses, present weight, the condition of the skin, eyes, nose, heart, lungs, tongue, bowels, bones, and the temperature. All these points are noted and recorded. It is only by such an examination, requiring much time and patience, that we are able to become thoroughly acquainted with the case in hand.

The child must be stripped for the examination, when the conditions found are entered in the proper spaces in the history chart. After the family history has been taken and the general physical examination is completed, we are in a position to devote ourselves to the present condition of the patient. After one has practised for a time, thoroughly examining every new case, he is impressed not only with the value of the method as bearing upon the management of the condition in question, but also with the unexpected pathologic findings in other organs, particularly the heart, throat, and lungs. Limiting the examination to feeling the pulse, which the doctor usually does not feel on account of the struggles of the child, and the inspection of the tongue, which is usually alike unsuccessful, should not be the practice of a competent physician.

ESSENTIALS IN THE CARE OF ACUTE ILLNESS

Our first intention, in our relation with a sick child, regardless of the nature of the illness, is to appreciate the changed conditions which exist. A well child, regardless of the position he may occupy in the social scale, subscribes to a certain living régime, which should be so fashioned as to supply the requirements of nutrition and healthy growth, which means normal development. Thus, he is fed, clothed, and has the benefit of fresh air, exercise, and bathing. When the child becomes ill, his position temporarily is changed, and in order for us to act to his best interest, radical changes must be instituted in order to meet this changed condition as regards appetite, sleep, the digestive capacity, and quiet. The great majority of the serious illnesses in children are acute in character. Every child begins the illness with a definite number of strength units. Vitality and resistance determine in no small degree the issue of the disease. We must so act as to conserve every strength unit.

Our first duty, then, toward the sick child is to place him in the most favorable position, in order that he may be able to withstand the ordeal through which he must pass. Regardless of the nature of the disease, certain requirements must be fulfilled that apply to all severe illnesses, the general management of which in children is very similar.

Patient to be Kept in Bed.—The patient is to be kept in bed, not held on the lap. The handling of the patient, the passing from one

person to another, the attempt at entertaining, cause active excitement and waste energy, when quiet is necessary.

Quiet Attendants.—Attendants who are quiet and agreeable to the child should care for him. In my seriously sick cases—pneumonia, endocarditis, and the like—I allow but one person, and that the attendant, in the room at one time.

Clothing.—The clothing should be the usual night-clothing, to which the patient has been accustomed in health. There is no illness that requires extra clothing for the body when the customary room temperature (66° to 68° F.) is allowed. Heavy shirts and oiled silk or cotton-wool jackets are never to be employed, regardless of the nature of the illness.

In summer the lightest clothing should be used; for younger children a thin linen slip with the addition of a napkin is all that is required.

Sponging.—The patient is sponged over once or twice a day for cleansing purposes, regardless of the nature of the illness. During the hot days of summer the sponging may be repeated several times with advantage. There is no disease of childhood in which the application of water to the skin is a dangerous procedure. On the contrary, it is quite necessary that the skin be so treated that it functionate actively.

The Sick-room.—In summer, a cool, quiet room, large if possible, with wide-open windows, or its equivalent out-of-doors, should be selected for the patient. During the colder months a generous air space is most desirable.

Room Temperature.—In winter the thermometer should never go above 70° F. Hot, ill-ventilated rooms depress the vital powers. The child is poisoned by carbonic dioxid; he is made restless and irritable. He uses up nerve force and energy is wasted. A room temperature of 66° to 68° F. is best under most conditions. There are few households which cannot have a thermometer.

Ventilation.—There must always be a communication between the sick-room and out-of-doors. A convenient means of ventilation is the window board (p. 150).

Cold Air.—I am not inclined to advocate cold air to the extreme degree advised by some. A wide-open window during illness, such as convalescence from acute pulmonary disease, I consider an excellent measure if the child is suitably protected by a hood and an extra outer garment. When possible, I give the patient the advantage of two rooms, one for use during the day and one for the night. This is of particular advantage in grip and in the respiratory diseases in which there is a possibility of reinfection. The room which is not occupied should be aired continually.

Drinking of Water.—There is no illness of childhood in which water to drink should not be given freely. If there is any question as to its purity, it should be boiled.

Diet.—The digestive capacity of every sick child is lessened; this

we all appreciate, the degree of incapacity depending largely upon the severity and nature of the illness. In every illness the food strength should be lessened. This we do not all appreciate. For breast-fed babies this is done by giving water, sugar-water, or some cereal decoction, as barley-water, before each nursing, usually from two to three ounces. This dilutes the mother's milk. The nursing baby is satisfied when his stomach is full. He needs as much fluid as usual, but is unable to digest the usual amount of breast milk. For the bottle fed, the food strength is reduced by substituting water for a given quantity of the milk mixture. A safe rule to follow is to reduce the food strength one-half by the addition of water. If the illness is a very severe one of intestinal disorder, whether typhoid fever or summer diarrhea, milk is discontinued absolutely, and usually cereal decoctions are substituted. During a very severe attack of pneumonia or scarlet fever milk is also discontinued, and cereal gruels are given. If the milk must be withheld for several days, milk-sugar is added to the cereal-water substitute so that it shall contain 5 per cent. of milk-sugar. This is obviously to supply fuel for the organism and spare the proteid tissue. When the usual feeding is continued, gastro-intestinal infection is sure to add to the burden of the patient through toxins absorbed from the putrefaction of undigested milk in the gut. The resulting tympanites is a very serious feature in respiratory and cardiac diseases. Tympanites embarrasses the action of the overworked or diseased heart and interferes with respiration already sufficiently obstructed by the processes in the lungs or in the pleural cavity. The carbohydrates leave no by-products to be eliminated by the kidneys, thus lessening the work of these diseased organs, and perhaps preventing their involvement in such diseases as scarlet fever and diphtheria, by diminishing the amount of irritation to which they may be subjected. In short, we must allow just as much food as the patient can care for. When we give more, we diminish the chances of recovery through added toxemia or by interfering with the vital processes.

Needless Interference.—Regardless of the nature of the severe illness, we must conserve vitality by disturbing the patient as little as possible. The various attentions to the child should be given at distinct, but reasonably long, intervals. It is rare that a child will need food or medication oftener than once in two hours during the night—three hours answer in most cases. Food and medicine may be given at the same time. Not infrequently I see cases in consultation where something is being done to the child every hour in the twenty-four. This would exhaust any well child. What can the effect be upon the very ill, but to diminish chances of recovery?

Urine Examination.—Nephritis is a complication, and a serious one, that may be looked for in all acute diseases of children. An early recognition of this complication is most important. Albumin in the urine is one of the earliest signs of nephritis, and involvement of the kidneys may be discovered by urine examinations before any of the other signs of nephritis appear. It is my custom, in scarlet fever and diph-

theria, diseases peculiarly liable to nephritic involvement, to examine the urine daily—in other acute diseases with fever, at two- or three-day intervals. This examination is simplified by writing a prescription for an ounce of nitric acid (c. p.) and a few test-tubes, which are kept in the sick-room. The cold test is sufficient to detect the smallest trace of albumin. When the physician must carry the urine with him or have it sent to his home, the examination is sometimes postponed or otherwise neglected.

Bowel Function.—Every nurse or mother is given a standing order that there is to be one evacuation of the bowels daily, and if this does not occur naturally, an enema is given.

Bowel Feeding.—In conditions of collapse in any illness, in coma and certain gastric disorders particularly, sufficient nutrition cannot be given by the stomach. When such a condition obtains, regardless of the illness, we must resort to colonic feeding (p. 121).

Suppression of the Urine.—Suppression of the urine is not an unusual occurrence in pediatric practice, and may occur in a wide range of diseases. One of our most successful means of combating this condition is the use of colonic flushings (p. 763).

Pyrexia.—High temperature in children, regardless of the nature of the illness, is to be managed by the same methods. The most satisfactory in my hands has been the abstraction of heat through the means of hydrotherapy, in the use of sponging and packs. It is a popular belief among laymen that cold should not be used in scarlet fever or measles because of some unfavorable influences excited on the rash. There is no disease of childhood with temperature in which the application of water to the skin does harm. I use spongings and packs in scarlet fever exactly the same as in pneumonia or typhoid fever.

When is elevation of the temperature to be interfered with? What are the indications that necessitate interference? When we have a degree of temperature that causes restlessness, loss of sleep, rapid heart action, with resulting loss of vitality—*i. e.*, wasted energy—then I believe that means for reduction should be instituted. This will be necessary in some patients at 103° F.; in others, at 105° F. In other words, we should be governed largely by the effects of the temperature upon the individual and not by the reading of the thermometer. If sponging is employed, I use one part alcohol with three parts of water at about 80° F. The skin is repeatedly moistened with the solution, which is allowed to evaporate. In some patients such a procedure is soothing. In others it occasions no little annoyance, in which event it must not be used. By far the most satisfactory hydrotherapeutic procedure consists in the use of the pack (p. 747).

Drugs.—Regardless of the nature of the disease, a full dose of castor oil is of benefit at the beginning of the illness. Every child admitted into the Babies' Hospital of New York city gets two teaspoonfuls of castor oil and a bath.

When drugs are used, it is essential that no harm shall result.

In any illness in a child one requirement is to keep on good terms with the child's digestive tract. In our medication we must seek to protect the stomach. This may be done by giving much of the medication after meals, using it by preference in capsules, powder, or tablet; when administered between meals, it is to be given well diluted with water. When liquid medication is necessary, elixir simplex in small amount is employed as a flavoring medium. Useless syrups are to be avoided. The worst possible custom, to my mind, is the using of heavy syrups for flavoring. The practice of giving the ammonia salts and ipecac, usually with syrup of tolu, to a child with severe bronchitis or bronchopneumonia is wretched; and this is putting it mildly.

Stimulation.—I have two criticisms of general application as relates to the management of sick children. The first is that heart stimulants are used too early and in too large dosage, and that antipyretic measures are resorted to when such management is not called for. I have already referred to the latter in stating that a child should not necessarily have antipyretic measures used because he has fever with pneumonia, typhoid, or scarlet fever. Neither does he require stimulation because he has typhoid or scarlet fever or pneumonia. Regardless of the nature of the illness, our choice of stimulants is very much the same, and our reason for using them is exactly the same—to assist a heart that needs help. The employment of heart stimulants will be discussed in detail under proper headings in the different chapters.

It will be seen, from the foregoing, that the treatment of different diseases of children has many features in common, and these essentials must be appreciated by every man in order that he do the best work in treating children.

If there is one thing that has been impressed upon me in an active life of twenty-five years in children's work, it is the necessity of completeness of detail in our management. We little realize how sensitive the sick child is, how all nervous effort, all untoward influences, cost something. They cost energy and output of vitality which may be sufficient to determine the issue for recovery or against it. Family coöperation is necessary for success, and will be best obtained through the confidence and affection engendered by thorough, painstaking work on the part of the physician.

THE SICK-ROOM

If there is a choice of rooms for the patient, the size of the room and the means of ventilation are important points to be considered in the selection. During cold weather a room with southern exposure, to which the sun has free access, should be chosen. During the hot months of summer, however, the cooler the room, the better, provided the size and ventilation are satisfactory. The furnishings should be of the simplest, only those articles being allowed to remain which are required for the patient. So many of the ailments of childhood are of

an infectious nature that only such articles of furniture as can be washed should be used. Curtains, hangings, and plush furniture have no place in a sick-room. A plain wooden floor is much better than a carpeted one. Enameled beds and plain wooden or enameled chairs and tables are best. A painted wall is much better than a papered one. A fireplace is desirable not only for heating purposes, but also for ventilation. The successful treatment of severe illnesses in children is often determined by careful attention to every detail in the care of the patient. A child ill in a dirty, badly ventilated, overfurnished, overheated room is from the first at a decided disadvantage.

The Window-board.—A convenient and simple means for ventilating the living-room, sleeping-room, or sick-room of a child in cold weather is what is known as the window-board. A plain inch board is sawed the width of the window-frame and placed under the raised window in the lateral frame groove, resting upon the sill. This raises the top of the lower sash above the bottom of the upper one, leaving a space between, through which the air enters with the current directed upward. The board may be of any width—four, six, or eight inches. A width of six inches is commonly used. There are various ventilating devices in the market. Those that are of value are expensive, and their effectiveness over the simple means above suggested does not warrant the expenditure.

WRITTEN DIRECTIONS

If possible, directions for the care of sick children should be given outside the sick-room, so that the physician may have the undivided attention of the mother or nurse. These directions should first be given orally and thoroughly explained, and then written out in detail. When the child is crying, and two or three onlookers are talking, the mother or nurse becomes confused and is almost sure to misunderstand or forget important directions.

If there is not a trained nurse in charge, the doctor should show the mother or nursery maid how to perform the various offices for the child. One can in a few moments be taught how to read the clinical thermometer, how to give a sponge-bath and an enema, and how to do many other things which the changed condition of the child requires. The use of a croup kettle, which may be needed for croup or bronchitis, should always be explained.

I have found the printed form as given below very useful not only in making the directions absolutely plain and unmistakable, but also as a great time-saving measure. The expense of printing is but a trifle. *Form A* represents the front of the slip. A few minutes only are required to fill in the blank spaces. *Form B* represents the back of the slip; on this the observations of the preceding twelve or twenty-four hours are entered. One chart may be made to answer for twelve or twenty-four hours, and when the case is finished, we have a complete record, secured with the expenditure of little time and labor.

FORM A

Date Name Age Disease

ORDERS

Food.
Temperature to be taken every...hrs.
℞ 1 every...hrs.
℞ 2 every...hrs.
℞ 3 every...hrs.
Whisky every...hrs.
Brandy every...hrs.
Steam Inhalations every...hrs.
using
Sponge Bath for...min. every...hrs.
at...°F., if Temp. reaches ...°F.
Cool Pack to be given if Temp. reaches
...° F., and continued until Temp.
falls to...°F., using water at...°F.

Spray Gargle Throat with
every...hrs.
Irrigate Throat with
every...hrs.
Irrigate Ear with
at..°F., every...hrs.
Irrigate Colon with
at..°F., every...hrs.
Counterirritation with
Mustard....parts
Flour ....parts
to every...hrs.
Give Enema of Soapsuds
Saline at...°F.
at....o'clock if necessary.

FORM B

Date

CLINICAL NOTES

... ... hour.
Temperature °F. °F. °F. °F. °F. °F.
Pulse
Respiration
Sleep — Nourishment
Skin
Tongue
Throat — Vomiting
Lungs — Stools no. in 24 hrs.
character
Heart
Abdomen — Urine amt. oz. in 24 hrs.
Nervous Symptoms — Blood
Special Symptoms

NECESSITY OF METHOD IN THE MANAGEMENT OF CHILDREN

During my work in pediatrics among all types and classes of people, I have been particularly impressed with the fact that some children are the source of an immense amount of trouble, while others of no better health or greater strength cause very little anxiety on the part of their parents. Children differ greatly as regards individual traits and disposition, but these can be fashioned to a great extent by proper management. The more spirited the child, the greater need of method in the care. I know mothers who are worn-out, nervous wrecks for no other reason than a lack of system in the management of the daily life of their children. Thoroughgoing, conscientious mothers they may be, but they represent that large number of mothers who have never been taught that certain functions and duties should be performed only at certain definite times every day. This subject is considered not from any moral standpoint but simply because of its bearing upon health.

Beginning at birth, the baby should be fed or nursed at definite times and at no others. Sleeping should never interfere with the nursing hours. The child should have time for undisturbed repose, and a midday nap should be insisted upon until the end of the sixth year. The definite time for meals, with properly selected food, should

be continued throughout adolescence. The child should be bathed at a certain hour and aired at a certain hour. "Runabouts" should have their hours for play and should retire at a definite time every evening. Such a régime is conducive to perfect health, consequently to better growth and development and to a stronger manhood. It is idle to say that many parents, particularly among the poor, cannot conform to such requirements. The poor are just as anxious to do the best for their children as are the rich, and will do this to the best of their ability if reasons are explained to them. If they cannot reach the ideal, they will attain to a higher degree of efficiency by striving. The trouble ordinarily is not with the mother, it rests more with the medical adviser, who is largely responsible for the ignorance of the mother and the resulting harm to her offspring.

TREATMENT OF THE INDIVIDUAL

In these days of specialization, in associating with medical men in consultation or otherwise, one is sometimes impressed with the fact that there is a tendency for the patient, the individual, to be lost sight of, to be overshadowed by the immediate disease or condition from which he may be suffering. In children the success of the treatment in practically every chronic ailment depends upon the vitality of the individual patient and his powers of resistance as a whole, to a much greater degree than is the case with the adult. The object of taking up this subject is not to be unkindly critical, but to call attention to one phase of the management which is not sufficiently appreciated by many who have to deal with children in their professional work. Not at all infrequently, poorly conditioned children, who have been treated for months by local measures for a skin affection, recover without any local treatment whatever (other than an attempt perhaps to relieve the itching) when their lives are ordered according to the requirements of the growing child as regards nutrition, bowel evacuation, sleep, suitable clothing, fresh air, and rational exercise. I have seen cases of chronic rhinitis and bronchitis which had persisted for weeks respond promptly when local measures, sprays and douches, and the internal use of drugs were suspended and the child's life was directed along rational lines. Those who treat tuberculosis and chronic bone diseases, chronic otitis, chorea, and hysteria, are to be reminded that their work is not half finished when they have directed the usual daily or weekly routine treatment. In these chronic ailments it is folly to expect what a cure really means (a constructive process) on a destructive diet and improper habits of life. Children possess marked recuperative powers, and the rapidity of progress toward recovery is often most gratifying when right conditions are instituted as relates to these fundamentals in child management; viz., food, sleep, clothing, and bathing. It is the height of folly to give children iron for anemia and allow them every form of indiscretion in diet. It should always be remembered that the best results are obtained in the treatment of a child, whatever the nature of his illness, when he has a child's normal existence, and it is only under such conditions that satisfactory results of treatment can be expected.

III. DISEASES OF THE NEW-BORN

PREMATURE AND CONGENITALLY WEAK INFANTS

Comparatively few infants born before the completion of the twenty-eighth week of pregnancy survive the first year. Reported cases of survival of those born before that time are usually unreliable, as the reports seldom follow the child beyond the third month. The prognosis is influenced by the factors causing the premature birth. If syphilis is present, the child may survive but a day or two. Children whose births are forced because of kidney disease in the mother do not appear to do as well as others. In children's institutions I have treated a large number of premature infants and have had anything but brilliant results with them. They not infrequently live to be two, three, or four months of age or older, but on account of reduced vitality they readily succumb to the slightest ailment, a mild bronchitis or fermentative diarrhea being sufficient to terminate their existence.

In the management of the premature and delicate newly born there are three points to be considered—the air the child gets to breathe, the nourishment, and the maintenance of bodily heat. It is also to be remembered that we are dealing with an undeveloped body which is not ready for the environment in which it is placed. The premature baby should be handled only when necessary, and then in the gentlest manner. Bathing is often best omitted for the first few weeks, oil being used for cleansing purposes. Because of the undeveloped parenchyma of the lungs unusually good fresh air is required. Because of the undeveloped heat-centers the body-heat of these infants is quickly lost and must be maintained by artificial means. The stomach is small and the digestive processes are undeveloped and weak, so that the nourishment should be of the most easily assimilable character.

Artificial Heat.—The maintenance of heat is of the utmost importance. For this purpose incubators and their various modifications have been used from time to time. My experience with incubators has been unsatisfactory. They may, under careful watching, maintain an even temperature, but all that I have used have been defective in supplying fresh air to the child. My incubator babies invariably have done badly. If the electrotherm (Fig. 14) is not at hand, the padded crib with the child wrapped in cotton and surrounded by hot-water bottles is the best means of maintaining the temperature. A thermometer should rest between the cotton and the bed-clothing as a guide to the nurses in the use of the hot-water bottles. Ordinarily this should register between 85° and 95° F., depending upon the temperature of the child, whose rectal temperature should at first be taken frequently. If there is a tendency for his temperature to be greatly reduced,—below 95° F.,—more external heat will be necessary than if the temperature

is 97° or 98° F. The best device among those which I have had an opportunity to observe for maintaining artificial heat is the electrotherm advocated and described by Holt, "Diseases of Infancy and Childhood," 1906.

"These small heaters are attached to an electric fixture, like a drop-light. A convenient size is from 10 to 15 inches. It is placed between two or three thicknesses of blankets, upon which the infant lies in its basket or crib. The degree of heat can be regulated according to the amount of electricity turned on. This mode of handling premature infants has been given a thorough trial at the Babies' Hospital and has been found to fulfil the indications, with children as small as three pounds and as young as seven months, quite as well as the incubator, while at the same time being free from its dangers. It has not been necessary to raise the general temperature of the room. These patients when kept in the wards at an ordinary temperature have maintained

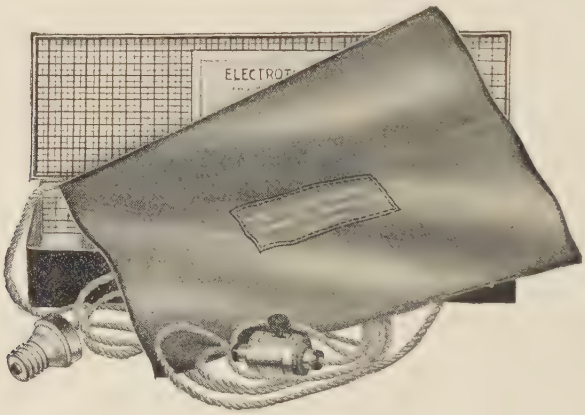


Fig. 14.—Electrotherm.

an even bodily temperature much more uniformly than with any other method I have seen, the incubator included."

Fresh Air.—A mistake often made in the management of premature and delicate infants is that of providing too warm air for respiration, a glaring defect in most incubators. The best method of decreasing a delicate child's vitality and resistance and increasing his chances of pulmonary infection is to supply him constantly with air at 80° to 90° F. In a modern house the maintenance of this temperature usually means an absence of change of air and an abundance of bacteria. The patients do best when the temperature of the air they breathe is from 70° to 72° F.

Feeding of Premature Infants.—Breast-milk for premature infants born under twenty-eight weeks is almost a necessity, and should always be procured when possible for all premature children. The mother, with the rarest exception, is unable to supply it, so that a wet-nurse

should be secured. In selecting a wet-nurse for a premature baby it is advisable to take the wet-nurse's baby also, as the premature infant may not be able to nurse, or if he nurses he will not take all the milk. Pumping the breasts of a wet-nurse will almost invariably dry them up if her own baby is not with her to furnish the necessary stimulation of nursing. Sufficient milk may be removed by the breast-pump to supply the premature infant if he is unable to nurse, and the wet-nurse's baby will empty the breast. For premature babies who refuse the breast or are unable to take a nipple, the Breck feeder (Fig. 15) may be used as a means of giving nourishment; or gavage (p. 758) may be brought into use. To this I have been obliged to resort in several cases. The Breck feeder consists of a graduated glass tube, narrowed at one end. Over this end is placed a small rubber nipple, the other end being closed by a flexible rubber cap. Suction on the nipple is aided and encouraged by pressure on the air-filled cap. If the breast-milk proves too strong, it may be diluted with equal parts of a 6 per cent. sugar solution, from one-half to one ounce of the mixture being given at first at intervals of from one to one and one-half hours. Fourteen to 15 feedings may be given in the twenty-four hours, the amount depending upon the child's digestive ability. If human milk is not obtainable, whey made from whole milk may be given, the nutritional equivalent of which is approximately 1 per cent. fat, 1 per cent. proteid, 5.5 per cent. sugar; or one ounce of gravity cream may be given with one ounce of milk-sugar and 15 ounces of water, which affords a nutritional equivalent of 1 per cent. fat, 5 per cent. sugar, and 3 per cent. proteid. Evaporated milk (p. 114) is a useful means of feeding in these cases. The food strength is increased, the intervals are made longer, and the feedings larger, as the patient proves able to assimilate the food.

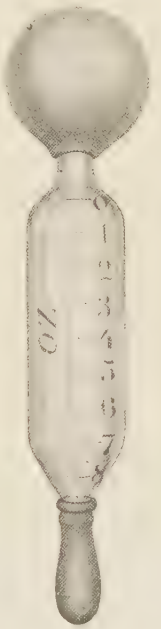


Fig. 15. — The Breck feeder.

The premature child requires unusual advantages, and even when but one month premature, rarely "catches up" during the first year, sometimes not for two or three years.

CEPHALHEMATOMA

These tumors are usually situated at the site of the caput succedaneum, and are composed of blood. Sometimes pressure of the forceps is accountable for their presence, but rarely can any injury be found. During a long and tedious labor the pressure on the blood-vessels of the scalp is increased, and this is thought to be an active cause in the formation of these tumors. Blood changes are also cited as a possible etiologic factor. The cause cannot be ascribed entirely to pressure against the presenting part, as we find cephalhematomata in breech

as well as in vertex presentations. The hematomata are of three varieties, as shown by Fig. 16.

Double cephalhematoma may exist.

Pathology.—These tumors are generally situated over the parietal bones. The scalp may show small hemorrhages and ecchymotic areas. The tumor itself is composed of blood. Soon after birth, the blood is usually in a fluid state, while in later cases coagulation has taken place. The tumor may be infected with pus-forming bacteria and an abscess may result.

Symptoms.—Soon after birth—anywhere from the first to the fifth day—a tumor is seen occupying a position generally over the parietal bones. It is soft, gradually increases in size for about a week, and then diminishes; infrequently a ridge develops around the outer border of the tumor, giving the sensation upon pressure of a depressed fracture.

During the latter stage of the tumor a crackling sensation will be elicited on pressure by the fingers. There is no accompanying fever. The child shows no annoyance. The tumor does not pulsate. One must be careful not to confound this condition with scalp edema, as seen in fracture of the skull after severe traumatism. In uncomplicated cases the tumor gradually becomes smaller and smaller, until finally, after some five to twelve weeks, it disappears, sometimes leaving a slightly raised, uneven, bony base.

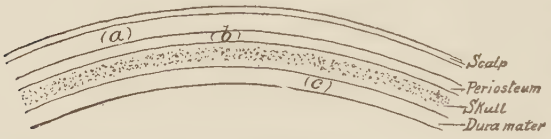


Fig. 16.—Varieties of cephalhematoma: (*a*) Between scalp and periosteum; (*b*) between periosteum and skull; (*c*) between skull and dura mater.

Diagnosis (Differential).—*Encephalocele* occurs along the lines of sutures or at the fontanels. Pressure may cause convulsions. With movements of respiration, the swelling may vary in prominence.

Hydrocephalus.—The head enlarges as a whole, showing separated sutures and large fontanels.

Caput Succedaneum.—Edematous, does not fluctuate. Disappears on second day.

Depressed Fracture of Skull.—Depression exists and not a tumor.

Prognosis.—In the uncomplicated cases the prognosis is usually good. The prognosis depends upon the amount of injury to the parts and the occurrence of any infection. Internal cephalhematoma with affusion is invariably fatal.

Treatment.—These tumors are usually absorbed if let alone. Care should be exercised that no injury may happen to them during handling the infant. No dressing is necessary. In infected cases, where the formation of an abscess has occurred, incision and drainage are indicated.

ICTERUS NEONATORUM

The theories relating to icterus neonatorum are most ingenious, but as all, or most all, are based on speculation, they are, as a result, most

unsatisfactory. In fact, only very recently has there been much experimental work along this line.

As Stadelmann stated years ago, "Without a liver, no icterus," so it is true today that theories excluding the liver as a participant are valueless. The forms of icterus in which biliary acids are demonstrated in the urine must be attributed to the resorption of bile in the liver. In icterus neonatorum the presence of biliary acids has been clearly demonstrated not only in the urine (Holberstein), but also in the pericardial fluid (Hofmeister). In view of these facts it is apparent that the liver must play the all-important part in the production of icterus because it is certain that the jaundice cannot be explained by hyperemia or capillary hemorrhage. The so-called hematogenous jaundice deserves more consideration in the light of recent experiments.

Such explanations as that of Franck, assuming a plugging of the ductus choledochus by means of mucus and cast-off epithelium, have been disproved. Of no further moment is the theory of Birch-Hirschfeld, who assumed an edema of Glisson's capsule; none of these assumptions has been verified by other observers. By anatomic examinations of the liver Bouchut's hypothesis of a hepatitis, and Epstein's theory of a catarrh of all ducts of the liver, have been demolished.

To the hematogenic factor, which has been strongly supported by Hofmeier, Stadelmann, and others, one must give more than a passing thought. These authors assumed that, as a result of this countless destruction of erythrocytes during the first days after birth, a polycholia resulted. This supposition of red-cell destruction has been refuted, the cause for the apparent destruction being attributed to increase in the blood-plasma. Only recently Heiman (Zeitschr. f. Geburtsh. u. Gynäk., 1912) has supported the blood-destruction theory, stating that an actual destruction of erythrocytes does occur. Assuming this later observation to be correct, one can readily see how with this destruction there is liberation of hemoglobin, which is taken up by the liver and transformed into bile-pigments. It is further apparent that when bile is thus produced in excess and is taken up rapidly by the liver in large amounts, the bile capillaries are overtaxed and the bile cannot be rapidly removed, but is reabsorbed into the blood, whereupon choluria develops. If this excessive production of hemoglobin increases over certain limits, the "threshold of the kidney" is reached and the hemoglobin is excreted through the kidneys, thus producing a hemoglobinuria (Pearce, Austin, and Eisenberg, Jour. Exp. Med., 1912).

The theory today, which, according to Finkelstein (Lehrbuch d. Sauglingkrankh., 1905), finds greatest acceptance, is that of Quincke. This author considers a patency of the ductus venosus to be the deciding factor; by a persistency of the lumen of this duct the bile passes directly from the meconium in the intestine to the portal vein, and, circumventing the liver, enters the inferior vena cava, thus producing the icterus. In the light of more recent research, however, this duct has been found open as late as the fourth week of life; thus if this anatomic fact be considered a criterion, we would not be led to believe that icterus was

produced by the patency of the ductus venosus, for if such were the case, icterus would be a phenomenon not of the first week, but of the first month of life.

According to Hess's observation with the duodenal catheter, bile is excreted into the intestine rarely during the first twelve hours of life, and is variable during the subsequent twenty-four hours, but in every one of his cases was profuse in icterus neonatorum. In many of his cases of marked jaundice the secretion was so profuse as to overflow into the stomach, which was demonstrated by the introduction of the stomach-tub. He further states that the cause of this condition is not at present definitely proved; however, if one follows the principles of the physiology of the secretion of bile, one can assume, what seems to be probable, that the icterus is due to an increased amount of available hemoglobin; further, that some bile salts are taken up from the intestine, resulting in this disintegration of blood-cells and a consequent increase of bile. Approaching the matter from another view, one can readily assume that the diminutive excretory mechanism of the liver at this stage is unable to cope with this excess of bile, which Hess has demonstrated, and that a congestion of the bile capillaries ensues, as is shown by histologic examinations, and icterus results.

Symptoms.—Probably 75 per cent. of all new-born infants show more or less icterus a few days after birth. The degree of jaundice varies greatly. In comparatively a small proportion of the cases the conjunctiva becomes deeply involved.

Infants showing marked jaundice may lose in weight as a result of this condition. The jaundice rarely persists longer than two weeks, and such a duration is seen only in the severe cases. In the majority of the cases the skin is clear in a week after the onset. The urine is usually free from bile-pigment. The stools are normal throughout.

Treatment is not required.

SCLEREMA

Sclerema neonatorum (Underwood's disease) is a rare affection of early infancy characterized by progressive induration of the skin.

Etiology.—The condition may be present at birth; the majority of the cases develop before the tenth day of life. Nearly all the reported cases have occurred in premature infants or those weakened by pre-existing diarrhea or pneumonia. Poor hygienic surroundings are included among the possible predisposing causes.

Pathology.—Parrot described the essential process as a drying-up and thickening of the skin, associated with a diminution in the fatty elements of the underlying connective tissue. Langer has ascribed the condition to a solidification of the fat as a result of low body-temperature, a phenomenon more readily possible in the new-born infant than in the older subject, because of the peculiar chemical composition of infant fat and its corresponding property of solidifying at a relatively high temperature (89.6° F.). Other authorities have likened the cutaneous changes of sclerema to those occurring in myxedema. Mensi* has re-

* Jour. Cutaneous Diseases, October, 1912.

cently distinguished three types of sclerema, depending upon the degree of atrophy in the skin. In all the forms atrophy of the subcutaneous connective tissue was the chief lesion. Northrup has reported a case in which microscopic examination of the skin revealed nothing abnormal.

Symptoms.—The chief general symptoms comprise progressive emaciation and asthenia, subnormal temperature, and failing pulse and respiration. The thickening and hardening of the integument begin, as a rule, in the lower extremities, and extend upward to the trunk and face. The skin assumes a yellowish, waxy hue, and later becomes livid and perhaps mottled. It is extremely tense, does not pit on pressure, and imparts stiffness to the motions of the joints and the play of the muscles of the face. Sucking and swallowing may be prevented. The infant usually dies within a few days, but exceptionally may survive the disease. Dr. Lotta Meyers* has recently reported a mild case in a female infant, without the usual subnormal temperature, death occurring on the twenty-fifth day.

Prognosis.—The disease is usually, but not invariably, fatal.

Diagnosis.—Scleroderma and scleredema, the only conditions resembling sclerema, may be distinguished by the fact that the first has not been noted before the second year (Stelwagon), while scleredema is seldom generalized or accompanied by extreme wasting, and does not deprive the skin of its color or elasticity under pressure.

Treatment.—The only management of possible value consists in the maintenance of nutrition and bodily heat. In suitable cases the incubator may be used.

SEPSIS IN THE NEWLY BORN

The newly born infant is peculiarly susceptible to infections, particularly with pyogenic bacteria. During this early period of life the normal bodily defenses are weakened. Phagocytosis, which is the great protector of the adult, is of little service to the newly born, who display little resistance against any bacterial invasion.

Etiology.—The cause of sepsis in the newly born is the entrance of some form of pathogenic bacteria into the body. These bacteria are usually of the streptococcus or the staphylococcus groups. The pneumococcus, the colon bacillus, and the Bacillus pyocyaneus may also cause the condition. These bacteria have been shown to exist even in normal breast milk, and they lurk in the air of hospital wards and dwellings. The lochia and amniotic fluid of the mother have been shown to contain them. The newly born infant is thus surrounded on all sides by bacteria ready to gain admission to his body. The severity of a given case of sepsis is proportionate to the degree of virulence of the bacteria at the time of the infection.

Sources of Infection.—Infection may occur through the mouth, which is probably the most frequent port of entry, through the nose, the skin, the rectum, the conjunctivæ, the digestive tract, the lungs, the ears, the urethra, the umbilicus, and, in girls, the vagina. Almost

*Jour. Cutaneous Diseases, 1909.

any portion of the body may be the seat of the infection. It is rare, according to the cases upon which I have made autopsies, to find only one organ or structure affected. Usually two or more portions of the body are involved in the septic process.

Parts Most Frequently Involved.—The following parts of the body are most frequently involved:

Umbilicus.—The seat of this infection is usually about, or in the substance of, the stump of the umbilical cord. The skin and tissues about the umbilicus are red, indurated, and show the usual signs of septic infiltration. The blood-vessels of the cord may be the seat of inflammation.

Peritoneum.—Peritonitis may follow the extension of the septic process from the umbilical cord to the peritoneum, and under such conditions often results fatally. The peritonitis may be local or general.

Joints.—The joint surfaces and membranes may be the seat of suppuration, or osteomyelitis may occur. Sometimes the epiphysis only is involved, and in other cases the shaft of the bone is affected.

Skin.—Single or multiple abscesses of the skin and underlying cellular structures are also liable to occur.

Lungs.—Pneumonia, usually of the bronchial variety, may develop as a septic process, with only vague symptoms, such as rapid respiration and cyanosis, accompanying the fever.

Intestines.—Diarrhea accompanies nearly all forms of sepsis in the newly born. Vomiting may occur.

Brain.—The meninges are rarely attacked by the septic process, and when they are involved, indefinite symptoms of meningitis are the result.

Heart.—A septic pericarditis may occur, but is extremely rare. Septic endocarditis is more common.

Prophylaxis.—This is of the greatest importance in guarding against sepsis. The obstetrician's hands and those of the nurse should be just as sterile when handling the newly born infant as they are in caring for the mother. Asepsis should be stringently observed in ligating the cord. The mother's breasts and nipples should be cleansed with boric acid before and after each nursing.

Prognosis.—Even in its mildest form, septic infection of the newly born is very serious. When structures such as the peritoneum, brain, pericardium, or lungs are involved, the disease is invariably fatal.

The red cells are decreased by disintegration, while the leukocytes are increased.

Treatment.—The management resolves itself into relieving the system of the infection, which is possible when its seat is in the skin. When there is multiple abscess-formation, incision should be made and followed by a wet dressing of a saturated solution of boric acid, or, if the area is not too large, a 1:5000 solution of bichlorid. If the site of the infection is at the umbilicus, the suppurating surface should be thoroughly cleansed and kept covered with a wet dressing of 1:5000 bichlorid, which should be changed at least every two hours. If there is erysipelas,

an ointment composed of 30 per cent. ichthyol in vaselin affords the best dressing. This should be freshly applied every four hours. The septic infant, whether the infection is mild or severe, usually nurses very poorly. Often both breast and bottle are refused. When a sufficient amount of fluid is not taken, plain boiled water or sugar-water, 5 per cent., or completely peptonized skimmed milk, may be given by gavage. If fluids are not given, the child is very apt to develop inanition fever, which, added to the infection, makes a serious condition more serious. From two to four ounces of a normal salt solution used lukewarm, injected into the descending colon through a catheter, will often be retained, with beneficial results. It should not be repeated oftener than once in six hours.

Medication other than small doses of alcohol—five drops of brandy, well diluted, every hour, if necessary—has been without avail in my cases. The prognosis at best is very grave, although cases in which the vital organs are not involved occasionally recover.

Illustrative Case.—An unusual instance of infection which ended in recovery occurred in my private practice. The child had no fever, but lost rapidly in weight and experienced marked prostration. The skin took on a greenish hue, and we were at a loss to discover the cause of the illness. The infection was suspected, but no portal of entry could be found; neither could we find any localized process until the nurse discovered that the umbilicus and the surrounding skin were bathed in pus. The umbilicus had apparently healed without any indication of local trouble. Investigation showed, however, that the infection had entered at this site, and, extending along the vein or artery, had become pocketed and formed an abscess 1½ inches deep. Enlarging the opening at the umbilicus and establishing free drainage were followed by a gradual closure of the abscess cavity and recovery.

ASPHYXIA NEONATORUM

Asphyxia neonatorum is a condition of the newly born of grave menace to the child's life, and requiring the most active and intelligent treatment.

Etiology.—The asphyxia is due to a subaëration of the blood of the fetus or infant. This subaëration may be caused by anything which tends to retard the interchange of carbon dioxid and oxygen in the fetal circulation, and may take place before or during labor. As a result of the interference of the placental interchange of gases, the products of metabolism in the fetus stimulate the inactive respiratory center. This at first causes respiratory efforts, with the aspiration of more or less air, meconium, or amniotic fluid, according to the infant's position in the parturient tract, and later, if the subaëration is not relieved by the quick extraction of the child, allowing access of air for the expansion of the lungs, produces depression of the respiratory center.

The causes operating antepartum include any conditions which interfere with the oxidation of the mother's blood, such as heart or respiratory disease in the mother, hemorrhage, or eclampsia; anything which causes a premature separation of the placenta, such as placenta prævia or accidental hemorrhage; and anything which causes pressure upon the cord or the child, as the premature rupture of the membranes, maternal convulsions, or tetanic contractions of the uterus. During

labor, likewise, pressure upon the cord from prolapse or malposition, pressure upon the head, with or without meningeal hemorrhage, or separation of the placenta before the delivery of the head, as in "vaginal birth," may cause asphyxia. Prematurity and congenital disability or defects, such as atresia of the pulmonary artery, may be causative factors inherent in the child.

Pathology.—The pathologic changes are due to the venous engorgement and the aspiration of fluids. The right heart is distended with fluid blood or soft clots; the vena cava, the large thoracic veins, the sinuses of the dura, and the hepatic vessels are also distended. The pulmonary vessels may be distended or not, according to the extent and degree of respiratory efforts made. As a result of aspiration the trachea and bronchi may be quite filled with mucus, meconium, blood, and amniotic fluid. The lungs may show areas of atelectasis, or may be partially aërated and intensely engorged. The liver is dark bluish in color. There may be punctate hemorrhages in various parts of the body.

Symptomatology.—It has been customary to divide the symptoms of asphyxia neonatorum into two groups, according to the color of the child and the state of the musculature—asphyxia livida and asphyxia pallida. They are essentially the same condition, asphyxia pallida being the terminal stage of asphyxia livida, and a case of asphyxia pallida (if recovery takes place) passing through the stage of asphyxia livida.

Asphyxia Livida.—The child who is in the condition of asphyxia livida presents a characteristic appearance: the skin is blue or livid, the mucous membranes are dusky, the sclerotics are congested. The pupils are equal and react, and the position of the eyes is normal. The respiratory efforts are infrequent and gasping. The heart action is rapid and tumultuous, and the heart-sounds are loud. The umbilical vessels are engorged and pulsate forcibly. The muscles are everywhere tense; the reflexes are active; the cutaneous sensibility is preserved, and the skin is warm. The anal sphincter functionates. The condition is a sthenic one, and analogous to the convulsive stage of ordinary asphyxia.

A child in this form of asphyxia may recover by the respirations becoming more frequent, the color changing to normal hue, the overacting heart quieting down, and a normal condition appearing; or the condition may pass by gradual stages into the other form, asphyxia pallida. The degree of asphyxia in the beginning may be midway between the two types.

Asphyxia Pallida.—The child with asphyxia pallida is limp and pale. The entire musculature is relaxed, the lower jaw and head hang down, and the limbs drop. Respiratory efforts are absent altogether or so slight as to escape detection. The cord is flabby, the pulsation is inappreciable, or can be hardly felt, and the cord, when cut, bleeds very little. The heart-sounds are usually faintly heard and may be slow or rapid. The sphincter ani is relaxed and allows the passage of meconium. The subcutaneous sensibility and reflexes are abolished.

The temperature is lowered one to three degrees. In this form spontaneous recovery almost never takes place.

Diagnosis.—The diagnosis of asphyxia neonatorum may be made intrapartum by detecting the slowing of a previously well-acting fetal heart, the passage of meconium in the liquor amnii, the trembling of the head in a breech extraction, and the so-called vaginal cry. Postpartum, the condition is recognized by the symptoms as detailed. Asphyxia neonatorum must occasionally be differentiated from meningeal hemorrhage, which is likewise caused by prolonged labor and which often occurs with asphyxia. When the hemorrhage is large, it can be readily recognized by the bulging, tense fontanel and by the existence of coma and possibly paralysis. Hemorrhage may affect the respiratory center, in which event the two conditions are really one.

Prognosis.—The prognosis without treatment is always bad. In cases of asphyxia pallida spontaneous recovery is rare, and even with the most active treatment many do not survive. After apparent recovery death may yet occur from weakness or injuries incidental to the initial asphyxia. Idiocy and feeble-mindedness may often be due to the same cause.

Prophylaxis.—In the treatment of asphyxia prevention belongs to the province of the obstetrician. Everything should be done to avoid any of the maternal causative factors, and in the conduct of labor itself the aim of the physician should be to deliver the child as quickly as is compatible with safety, not hesitating to apply low or medium forceps in preference to a long and tedious second stage.

Treatment.—The active treatment is directed toward maintenance of body heat and stimulation of respiration. The child, as soon as born, should be wrapped up, and if asphyxia exists, active treatment should immediately be instituted. The mouth and throat should be wiped free of the mucus, which will almost invariably be found, by means of the index-finger well wrapped with absorbent cotton or sterile gauze. It may be necessary to suck out the secretions by means of a catheter and a glass tube with a bulb on it to prevent the secretions from the mouth of the physician or nurse getting into the child's pharynx. This will be especially necessary when, as the result of respiratory efforts during the passage of the head through the pelvis, much amniotic fluid, mucus, etc., may have been aspirated. It is not advisable, however, to attempt much instrumentation of the larynx, but to rely on Schultze's method for bringing out aspirated secretions. The respiratory center must be stimulated. This may be attempted, depending upon the severity of the asphyxia, by tickling the nares, by administering the fumes of ammonia, by spanking ("flagellating the buttocks," Koplik), by the alternate use of hot (110° F.) and cold (60° F.) baths, the child being transferred rapidly from one to the other, always ending with the hot one, or by combining with these one of the various methods of artificial respiration, of which the simplest is perhaps the mouth-to-mouth method. Sometimes bleeding of the cord will relieve the intense congestion of the right heart and large thoracic veins, and allow

the heart to restore the circulation and relieve the respiratory center. The most commonly used methods of artificial respiration are those of Laborde, Dew, and Schultze.

The *Laborde method* consists in making rhythmic traction on the tongue, from 12 to 14 times a minute, which it is claimed excites respiration.

The *Dew method* consists in grasping the infant by the back of the neck with one hand and by the knees with the other. The upper and lower portions of the child are then approximated by a flexion of the thorax on the abdomen, and the reverse movement, extension, is next effected. Alternate flexion and extension are thus practised 15 to 20 times a minute.

Schultze's method is described by him and quoted by Edgar as follows: "The child lying upon its back is grasped by the shoulders, the open hand having been slipped beneath the head The last three fingers remain extended in contact with the back, whi each index-finger is inserted into an axilla, the thumbs lying upon and in front of the shoulders. When the child thus held is allowed to hang suspended, its entire weight rests upon the two fingers in the arm-pits. It is now swung forward and upward, the operator's hands going to the height of his own head; the pelvic end of the child rises above its head and falls slowly toward the operator by its own weight, flexion occurring in the lumbar region. The thumbs in front of the shoulders compress the chest, while the hyperflexed lumbar vertebræ and pelvis compress the abdomen, and through it the thorax; finally the last three fingers on each side compress the thorax laterally. As a result of this manœuver, when properly done, aspirated secretions flow abundantly from the mouth. The distended heart also feels the compression which forces the blood into the arteries. The child is now swung back into its original position and supported entirely by the fingers in the axilla. The compression of the thumbs and last three fingers is removed. The downward swing elevates the sternum and ribs, while gravitation and the traction of the intestines depress the diaphragm. It is often possible to hear the air rush into the infant's glottis as it reaches the original position, although this can occur in a cadaver. The amplification of the thorax lowers the intracardiac pressure. The child should be swung up and down 10 times for the space of a minute. The effects of the manœuver should be as follows: The heart-beat increases in frequency, the cadaveric pallor of the skin becomes replaced by a rosy hue, and the muscular tonus appears. The child is then placed in a warm bath and watched. If the inspirations are superficial, a momentary dip in cold water is indicated. If the heart-action becomes poor, the child should be swung again. If prolonged swinging becomes necessary, the root of the tongue should be compressed forward in order to raise the epiglottis and permit the removal of secretions with the fingers. In premature children the thoracic walls are often too soft to benefit by the compression of the fingers. In these cases insufflation of air should be practised."

In the cases of asphyxia livida, where the reflexes and the cutaneous sensibility are abolished, all attention should be devoted to the general stimulation of the child. The cord should be cut at once; it will often not bleed at all. The air-passages should be freed from accumulated secretions as before. The child should be put into a warm bath and artificial respiration attempted by the mouth-to-mouth method or Laborde's method. Rectal injection of one to two ounces of coffee infusion, or hypodermic injection of $\frac{1}{200}$ grain of strychnin, may be given and repeated in half an hour.

Signs of recovery in asphyxia pallida are a return of the cutaneous sensibility, a reappearance of the reflexes, an increase of the tonicity of the muscles, one or more respirations, or a gradually increasing cyanosis and venous engorgement approximating the condition of asphyxia livida. Finally, a gradual change to normal hue, with restored respiration and relaxation, indicates recovery.

A strict watch must be kept over the child for several days, for relapses are common. Oxygen must be at hand, and all apparatus ready for a resumption of the active treatment at any moment.

DELAYED ASPHYXIA

Asphyxia may occur after birth in a child who has had an uneventful delivery and who appears quite normal when born.

Etiology.—This form of asphyxia is due to some cause interfering with the proper continuance of the respiratory function. Developmental anomalies, such as defects of the nervous system, the heart, the diaphragm, the thoracic walls, or the lungs, or the general weakness of prematurity, may be the cause. Compression of the trachea by enlarged thyroids, and possibly by thymus glands, has been reported. Syphilitic pneumonia or bilateral pleuritic effusions or an enlarged liver may be the etiologic factors.

Symptoms.—The clinical symptoms correspond closely to those of ordinary asphyxia. The infant makes very feeble respiratory efforts or none at all; the heart beats with considerable strength, becoming weak as the asphyxia continues and approaches the stage of flaccidity.

Prognosis.—The prognosis is dependent upon the severity of the asphyxia and the removability of the cause.

Treatment.—Treatment is that of any form of asphyxia, and consists in stimulating respiration and circulation and the removal of the cause. Asphyxia due to prematurity should be treated according to the methods advised for caring for premature babies (p. 155).

ATELECTASIS

Atelectasis may be present in the newly born who come into the world asphyxiated, and it is not infrequently seen when there has been a prolonged, difficult delivery. Atelectasis may be the result of weakness, pure and simple, and is not of unusual occurrence in the premature. For some reason there is a failure or inability to dilate the air-vesicles. I have seen sudden collapse occur in marantic infants,

the child dying in a few moments with cyanosis and orthopnea, the autopsy proving the diagnosis of atelectasis. The condition may be produced also through compression of the lung with exudation in pleurisy, or by the obstruction of a bronchus with mucus. The most dangerous types are those which are present in the newly born and which occur in the weakly during early life. The warning symptoms are usually cyanosis and rapid superficial breathing, with or without convulsions.

Treatment.—The management of atelectasis, both in the newly born, who come into the world asphyxiated because of prolonged difficult delivery, and in those in whom the condition is the result of weakness, consists in making the child cry lustily. If auscultation over the lower lobes posteriorly does not show free vesicular breathing, the child should be made to cry every day, either by spanking or by plunging him first into water at 110° F. and again into cold water at 60° F., our object being to induce vigorous crying and thus dilate the air-vesicles. A recent case made satisfactory improvement by receiving oxygen inhalations for one minute out of every fifteen, with stimulation of various kinds to induce crying. Atelectasis from obstruction of a bronchus or from compression is usually readily relieved when the source of the trouble is removed. In out-patient work we occasionally see marantic young infants in whom there is an involvement of a considerable area of one of the lower lobes posteriorly without any sign whatever of discomfort. The process of resolution in these cases progresses from the periphery toward the center and is very slow. The condition is probably of much more frequent occurrence than is generally supposed, if we are to judge from the autopsy findings in cases of young infants, particularly in institutions.

CONGENITAL ABSENCE OF BILE-DUCTS

This malformation is of very rare occurrence. The first symptom, a rapidly developing jaundice, appears not later than the third day after birth. The jaundice increases rapidly, and in a few days is intense. In a case which I saw at the fifth month the skin was of a deep, greenish-yellow color, the conjunctiva was deep yellow, and the mucous membranes of the lips and buccal cavity were involved in the discoloration. In all cases after the passage of the meconium the stools become clay-colored and so remain. The urine is of a deep brown color. The liver is always enlarged.

Death usually results from inanition before the third month. In two cases the common duct was represented by a fibrous cord; in another there was an entire absence of the common duct.

The literature on the subject shows that there may be an occlusion at the duodenal end of the duct, or that the cystic or hepatic duct may be impervious.

Diagnosis.—In icterus neonatorum of the familiar type bile is never absent from the stools, even though there is a marked degree of jaundice, and the skin begins to clear in the second week. A continuation of the

jaundice without abatement after this time is suggestive of congenital obstruction of the ducts, and an examination of the stools determines the condition.

UMBILICAL POLYP

An umbilical polyp is usually the result of an overgrowth or an outgrowth of a neglected granuloma. The mass, which may vary in size from a flaxseed to a pea, is reddened, moist, and usually bathed in a viscid, mucopurulent secretion. There is often considerable excoriation of the skin about the umbilical opening. Sometimes the mass is so small that it is hidden by the overlapping folds of skin and its presence would not be suspected but for the secretion which keeps the parts moist. The polyps are very vascular.

Treatment.—Cutting the pedicle and applying nitrate of silver or carbolic acid is not a safe procedure. I have known severe hemorrhage to follow such treatment. About ten years ago I was obliged to sit for three hours by the side of a crying, wriggling child making pressure on the cut stump of an umbilical polyp after a colleague had cut the pedicle. In no other way could the hemorrhage be controlled. The best management in these cases is to ligate the pedicle and allow the polyp to wither and drop off. The powder referred to under the head of Granuloma should be applied after the ligature is fixed, and reapplied frequently before and after the polyp has dropped off, until the wound is cicatrized and dry.

MASTITIS IN THE NEWLY BORN

Inflammation of the breasts in the newly born, both in the male and in the female, is seen with considerable frequency in hospital practice. The mammary glands may be acutely tender and swollen to several times their normal size. These glands in young infants should not be pressed nor manipulated in any way more than is required for cleanliness. Not a few of my out-patient cases of mastitis have been due to the attempts of the midwife to express the milk from the breasts. The cases are explained by the fact that the opening of the nipple is large and the gland readily becomes infected from unwashed hands or unclean wearing apparel.

Treatment.—My cases have usually responded well to the application of ichthyol 25 per cent. in oxid of zinc, U. S. P. The ointment is spread generously upon old linen which has been boiled and dried, and is then gently bound upon the inflamed gland. Over this is placed oiled silk to protect the clothing, and, over all, a gauze bandage is applied with very light pressure. The dressing should be changed and fresh ointment applied every six hours. Wet dressings in the management of this condition in infants are not advised. In five cases the mastitis was beyond control when first seen, and suppuration of the gland—mammary abscess—followed, requiring incision and drainage, with loss of the gland substance.

Mammary Abscess in Infants.—Mammary abscess is the result of a

mastitis which has failed to undergo resolution. It occurs as frequently in males as in females. All my cases but two were seen in institutions or in out-patient work. In five the abscess developed under my own observation. In a female child, a patient at the New York Infant Asylum, both glands were entirely destroyed. As soon as pus is discovered the abscess should be incised and drained, with a view to saving as much of the gland as possible. Of course, this advice applies particularly to a female patient. Wet dressings are not applicable in cases of young infants when the parts covering the thorax or abdomen are involved. It is my custom to protect the skin from infection by the use of a 25 per cent. boric-acid ointment in cold cream as a base. This is applied on old linen about the abscess opening. The dressing should be changed three times daily.

TETANUS NEONATORUM

Tetanus is an acute infectious disease caused by the tetanus bacillus, an organism having its natural habitat in garden-soil or dung-heaps. Its point of entrance into the human body may be a lacerated wound, a mere abrasion, or, as is the case in tetanus neonatorum, the umbilicus. The local reaction may be very slight or attended by suppuration.

Tetanus is extremely rare in our hospitals and institutions for children because of the care exercised in treating the umbilical wound. Wherever gross uncleanliness prevails, tetanus neonatorum will be found. It is particularly prevalent among savage and half-civilized races.

The Tetanus Bacillus.—The tetanus bacillus is a slender, slightly mobile organism, positive to Gram's stain, growing only anaërobically, and developing a round spore characteristically placed at one end of the rod, giving it a nail or drumstick form. It was described by Nicolaier in 1885, and cultivated four years later by Kitasato.

The bacilli remain localized at the seat of infection, whence their toxins are carried along the axis-cylinders of the motor nerves to the motor cells of the spinal cord, pons varolii, medulla oblongata, and, to a lesser degree, the brain cortex. The localized spasms characteristic of the disease are due to the action of the tetanus toxin on the ganglion-cells.

Incubation.—From the second to the ninth day is the usual period for the development of the disease, although it may appear as late as the fifth or sixth week. The period of incubation of the tetanus bacillus in man is possible of wide variation. The disease may appear immediately after birth, or be delayed for five or six weeks. Few cases, however, develop after the third week of life.

Pathology.—The lesions found at autopsy in infants dead of tetanus neonatorum are few and non-specific in character. Acute omphalitis is usually present. The thoracic and abdominal viscera do not show any abnormality. The meninges of the brain and spinal cord are congested, while small hemorrhages into the nerve-substance are frequent. These are manifestly the result, and not the cause, of the tetanic spasms.

On microscopic examination degenerative changes in the nerve-

cells of the gray matter of the spinal cord are noted, but these changes are in no way specific.

Prognosis.—Few cases recover. Holt reports one recovery. The mortality is high. Those writers who have seen much of the disease place the mortality at 95 to 98 per cent.

Symptoms.—The earliest symptom usually observed is difficulty in nursing. The child attempts to grasp the nipple and lets go suddenly and cries. Perhaps the child will give a sudden start and cry as though in acute pain, which is doubtless the case. Examination of the patient will show well-marked trismus; the jaw is set; the jaw muscles are tense. Stiffening and relaxation of the muscles occur. As the case progresses the muscles of deglutition become involved, and swallowing is impossible. The lips are said to pucker in the position of whistling.

The temporary relaxations become shorter; there is a tonic spasm, and, at the slightest irritation, such as the dropping of a pencil or a sudden, awkward movement of an attendant, the muscle spasm increases until a marked permanent opisthotonos results. The temperature is usually high—104° F. to 106° F.; the pulse very rapid—180 to 200. Death is usually due to exhaustion. Spasm of the respiratory muscles is probably a factor.

Treatment.—The treatment consists in the use of antispasmodics—among which bromid and chloral are most frequently used. Large doses are necessary.

In Holt's recovery cases 8 grains of sodium bromid were given every two hours.

The patient is to be kept very quiet. Food and drugs are administered through a tube.

Tetanus Antitoxin.—Tetanus antitoxic serum is made by inoculating a horse with tetanus toxin formed by the growth in bouillon of the tetanus bacillus. Its prophylactic use has been of far greater value than its curative effect, and in every case of possible tetanus infection a dose of 1500 units of the antitoxin should be injected subcutaneously near the wound. In order to do good, after symptoms of tetanus have appeared, the antitoxin must be administered as early as possible. The New York City Board of Health advises giving the initial dose of 10,000 units intravenously, and, if possible, also into the spinal canal and into the sheath of the nerve of the affected part. These energetic measures should be followed by subcutaneous doses of 5000 to 10,000 units every six to twelve hours for four days. In more severe cases, or in those in which symptoms have been present for several days before the treatment was begun, the initial dose should be doubled. It is also recommended that the wound be treated with a solution of iodin and that large amounts of water be given for its diuretic effect, since tetanus toxin is eliminated by the kidneys.

UMBILICAL GRANULOMA

A granuloma at the umbilicus consists of a reddish, secreting mass of granulations involving the umbilical stump. It may vary in size

from the head of a pin to a pea. Granulomata usually occur in cases in which the care of the cord has been neglected. In out-patient work they are very frequently seen, and occur usually in children who have been delivered by midwives. The mother brings the child to the dispensary with the story that the navel will not heal.

The granulations are very vascular and bleed readily.

Treatment.—After thoroughly cleansing the parts, one or more applications of a 50 per cent. nitrate of silver solution, followed by the free use of an absorbent dusting-powder, soon produces a normal cicatrix. A powder of the following composition is recommended:

℞ Acidi salicylici ..... gr. xv
Acidi borici ..... gr. xxv
Pulveris zinci oxidi
Pulveris amyli ..... āā ʒj

The powder should be applied very freely at two-hour intervals during the day, or at least often enough to keep the wound dry.

HEMORRHAGIC DISEASES OF THE NEWLY BORN

In 1861 von Hecker and Buhl described a series of cases, under the title of "Acute Fett-Degeneration der Neugeborenen," that presented a somewhat similar picture without evidence of either syphilis or navel sepsis. Since that time this condition has been commonly called *Buhl's disease*. In the original article it was noted that most of the children were born in asphyxia. These cases showed the typical symptoms of the disease, and at autopsy all the viscera showed multiple hemorrhages as large as pin-heads or larger, together with fatty changes that may be extensive. The authors do not attempt to explain the etiology, but think that the condition is not due to navel infection and that it is not a manifestation of hemophilia because the ratio of males to females is not maintained as in hemophilia. In conclusion they say: "It is hardly necessary to state that one here has to do with a disturbance of metabolism manifested over the whole body, in which the changes in single organs are only a partial expression of the whole disease. This disturbance is evidently inborn, acquired in the last days before birth."

In 1879 Winckel tried to establish an entity distinct from the so-called Buhl's disease by describing a series of cases that manifested a slightly different clinical and pathologic picture. He considered this condition distinct from Buhl's disease, chiefly because it seemed to be epidemic in character and because the hemorrhages were more, and the fatty changes less, prominent than in the disorder described by Buhl. Winckel recognized the similarity of this condition to that of intoxication by phosphorus, arsenic, and potassium chlorate, and he ruled out, by careful histories and by chemical examination of the viscera, any possible participation of these drugs in the etiology of his cases.

In more recent times the Germans, in particular, have come to regard as Buhl's disease any condition affecting the new-born, that produces a severe icterus and fatty infiltration without evidence of infection;

whereas any similar condition, of which the chief features are icterus and hemoglobinuria, has been looked upon as *Winckel's disease.*

These two classifications, however, have failed to suffice for all the hemorrhagic icteric conditions of the new-born infant.

Various other names have sprung into rather general use, and have served to complicate the nomenclature by adding terms based solely on clinical and morbid anatomic differences.

Melæna neonatorum is a term that has been applied to conditions in which hemorrhage has occurred from the gastro-intestinal tract, without necessarily any clinical evidence of hemorrhage elsewhere. Since 1829, when Cruveilhier found ulcers in the stomach of an infant who presented evidence of a true melena, many others have recorded their presence with the result that a gastric or intestinal ulcer is usually considered to be the source of the hemorrhage in these conditions.

Syphilis.—These hemorrhagic conditions have frequently been found associated with congenital syphilis. There are hemorrhages, cyanosis, edema, icterus, etc., but in many cases evidence of syphilis is wanting. Cases of Buhl's disease have been recorded by Fürstenburg as occurring spontaneously even in the offspring of domestic animals, where presumably the presence of syphilis may be safely excluded.

Bacteria.—The rôle of bacteria has received the greatest consideration, for the following reasons:

1. The close similarity between these conditions and the picture produced by navel sepsis.
2. The epidemicity of at least one group (Winckel's).
3. The finding of organisms at autopsy.
4. The experimental production in animals of certain of these conditions by inoculation with bacteria.

The belief is now almost universally held that many different bacteria may produce these diseases, because of the variety of microörganisms that has been found at autopsy (staphylococci, streptococci, Gärtner's bacillus, pyocyaneus, colon, and various other types). The inoculation of animals by many of these organisms has frequently been followed by the production of diseases similar to those in human beings. In certain cases, at autopsy, lesions indicative of an infectious process, as, for example, hyperplasia of intestinal lymphatic tissue, have been found, but, on the other hand, such findings are frequently absent, and it is very striking that in many cases there seems to be very insufficient evidence that infection has played an important rôle.

In general one may conclude that there is strong evidence favoring the idea that many cases were caused by infections, and, on the contrary, insufficient evidence for assuming that all are infections.

Mechanical Means.—Mechanical factors, such as trauma, thrombosis, embolism (Landau), deserve only mention, as they have been found only very occasionally (Thomson).

Heredity.—The possible importance of hereditary influences was considered by von Hecker and Buhl when they stated that their disease was evidently inborn, and acquired during the last few days of preg-

nancy. The relation of heredity to true hemophilia neonatorum needs no further mention.

There are certain affections of the adult, at present of unknown etiology, which, if transmitted to the fetus, might cause their various syndromes in the new-born. Reference is made particularly to the closely related conditions of acute yellow atrophy, of eclampsia, and of certain septicemic conditions. Numerous observations are on record describing the pathologic changes in the offspring of eclamptic mothers, and it is particularly interesting that in general the abnormal features correspond closely with the icteric and hemorrhagic syndromes of the new-born.

Each report summarizes the pathologic changes as thrombosis and parenchymatous degeneration, fatty degeneration or necrosis, especially in the liver and kidneys, hemorrhages in the organs, and subphrenal, subepicardial, and subendocardial extravasations of blood.

Chemical Agents.—Finally, intoxication by known chemical agents occasions symptoms and pathologic changes similar to the disease in question. Among this long list of agents may be mentioned phosphorus, arsenic, potassium chlorate, and chloroform. That there are many features of these conditions that suggest a common general process has already been emphasized by Knopfelmacher.

Metabolic Changes.—The symptoms and gross changes are suggestive of poisoning by the above-mentioned agents, but they also occur in conditions of obscure etiology, such as acute yellow atrophy, eclampsia, and cyclic vomiting of children. All the chief features that characterize this latter group, including certain metabolic phenomena, such as appearance of lactic acid and sugar in the urine, not to mention others, are known to occur also after respiration of rarefied air or after asphyxia from any cause, that is to say, from lack of oxygen. In phosphorus-poisoning there is a deficiency of available oxygen. Chloroform does not belong to this group, producing deficient oxidation of the tissues; but it would seem, *a priori*, that there was some evidence to suggest the existence of a causal relationship between chloroform used at labor and the occurrence of some of these various conditions of the new-born.

Ewarts Graham (Chicago) concludes, after a careful experimental study, that the conditions of the new-born characterized by a hemorrhagic tendency, icterus, and fatty changes, are probably all syndromes which may occur as the result of a number of toxic agents. He has produced experimentally the essential features of the diseased group by the administration of chloroform to the point of asphyxia.

Duke believes that the bleeding is due to a deficiency in the number of platelets in the blood, and thus absence of thrombus formation, which is essential in order to produce clotting. In some cases the coagulation time is normal, in others, abnormal.

A considerable number of these cases have come under my personal observation. I have repeatedly seen hemorrhages from the newly born occur in the internal organs and from various portions of the body.

A colored infant at the New York Nursery and Child's Hospital bled to death in the pericranial tissues without a sign of hemorrhage elsewhere. Some cases were due to proved sepsis; in others there was no demonstrable lesion of the blood or vascular apparatus. It is this latter type that offers the most promising results from the human serum treatment referred to below.

Treatment.—The use of styptics and astringents for controlling the hemorrhage is useless. The only measure that has assisted me in any way has been the application of pressure to the bleeding parts, and this is not possible in many situations. Adrenalin, locally or by internal administration, has not been of any appreciable service.

Illustrative Case.—One of the most important contributions to the literature of hemorrhage in the new-born was presented in the Medical Record of May 30, 1909, by Dr. Samuel W. Lambert, of New York City. In this case a direct transfusion of blood from the father to the child was successful in stopping the hemorrhage when the case was almost hopeless.

Within the past few years the method introduced by Dr. J. E. Welch, of New York, has been successfully followed by many physicians. It has been successful in five cases coming under my observation.

Welch's methods consist in the injections, under the skin of the infant, of human serum which has been obtained under antiseptic precautions. The results are usually prompt. The hemorrhage often ceases after the first or second injection. The injections should be continued until the hemorrhages cease.

Welch writes as follows:*

"As to the dose of serum to be used in any given case, it should be said that this depends upon the urgency of the case. One is apt to err on the side of too small doses. It is advisable to begin with at least 1 ounce and repeat three times per day if the infant is bleeding only moderately. In severe cases it should be given every two hours, and in larger quantities if necessary. It is very important to begin the treatment at the first indication of bleeding, however apparently insignificant. Slight bleeding of the cord may be accompanied by fatal internal hemorrhage if not stopped immediately.

"The blood is very easily collected. The apparatus I have devised consists of a rubber cork through which are two perforations. Through one perforation is fitted a U-shaped glass tube, to the outer end of which is attached,, by means of a piece of rubber tubing, a short aspirating needle having a No. 19 caliber. The needle is cotton-plugged into a small test-tube, in which it is sterilized. Through the other perforation is inserted a fusiform glass tube containing cotton to prevent contaminating the contents of the flask. A small suction tube is placed on this latter for drawing the blood into the flask. The needle is inserted into a vein at the elbow and the desired amount of blood withdrawn. The blood is allowed to coagulate in a slanting position in the flask, and the serum is withdrawn as rapidly as it separates; it is then ready for use. It is advisable to continue the use of the serum for a day or two after

* American Journal Medical Sciences, June, 1910.

the bleeding has ceased, in order to insure a control of hemorrhage that may be going on in hidden sources."

THE TEETH

Twenty teeth comprise the first set. In the well child the first tooth usually appears between the sixth and the eighth months; the first teeth may, however, in perfectly normal cases, come earlier or much later. I have known well, vigorous children who did not get a tooth until the thirteenth month. The first teeth are usually the two lower central incisors. The four upper incisors and the two lower lateral incisors appear normally between the eighth and the tenth months. The first four molars appear between the twelfth and the fifteenth months; the four canines between the eighteenth and the twenty-fourth months; the four posterior molars, which complete the first set, between the twenty-fourth and the thirtieth months. This regularity in the appearance of the teeth is by no means constant, even in well children. I have repeatedly seen the upper central incisors cut first, and in several instances the upper lateral incisors have appeared first. In delayed dentition in rachitis and other forms of malnutrition, the teeth are very apt to appear irregularly. In a markedly rachitic dispensary patient the bicuspids were the first teeth cut.

Care of the Teeth.—As soon as the teeth appear they require attention. Until the second year is reached the mouth should be washed out at least twice a day with a solution of boric acid—½ ounce to a pint of water. This can best be done by means of absorbent cotton wound around the tip of a clean index-finger and afterward dipped in the solution, which should be applied with gentle friction to the gums and teeth. When a child is two years old, it is well to begin the use of a soft tooth-brush and a simple tooth-powder composed of the following ingredients:

℞ Precipitated chalk ..... ℥j
Bicarbonate of soda ..... ℥j
Oil of wintergreen ..... q. s.

The child should also be instructed as to the proper use of a quill toothpick. The teeth of every child over two years of age should be examined by a dentist every six months. Cavities discovered in the first teeth should be filled with a soft filling.

The milk teeth are lost between the sixth and the eighth years. They should not decay, but fall out or be forced out by the second set.

The Permanent Teeth.—The permanent set comprises 32 teeth. The second dentition begins about the sixth year, and is usually completed about the twentieth year, although it may be delayed several years. The permanent teeth appear in somewhat the following order:

First molars	sixth year.
Central incisors	sixth to seventh year.
Lateral incisors	seventh to eighth year.
First bicuspids	ninth to tenth year.
Second bicuspids	ninth to tenth year.
Canines	eleventh to twelfth year.
Second molars	thirteenth to fifteenth year.
Third molars	after the eighteenth year.

Dentition.—It is claimed that the eruption of the teeth is a physiologic process, and as such is not productive of harm. In normal well babies this is generally the case. There may be a slight fever and restlessness, with loss of appetite, associated with the eruption of a tooth, but the disorder is usually very temporary in character. In delicate children, particularly in those who teethe late, as in the rachitic, when several teeth are cut at one time, not a little inconvenience may be caused by dentition. Even these patients, however, rarely have grave digestive disorders. In a large experience with teething infants I have known but one in whom convulsions were apparently directly dependent upon dentition. The patient was a rachitic, institution child who cut his first tooth at the ninth month, and with each of the three succeeding teeth, which were cut during the next three months, developed convulsions without any other signs of illness.

Temporary digestive disorders are of very frequent occurrence in this type of child during an active dentition. The child may be restless and irritable and perhaps have fever of a degree or two. His digestive capacity is lessened, and if the usual diet is continued, fermentative diarrhea results, which may be, and often is, the starting-point of grave intestinal disease. When it is apparent that the child's generally good-natured, daily habit of life is being unfavorably influenced by dentition, the food should temporarily be reduced, particularly if the weather is hot.

Breast babies may be given water before each nursing so as to reduce the capacity for milk. For the bottle-fed two or three ounces of the food mixture may be removed from each bottle, replacing the amount with boiled water.

That cough, respiratory, and skin diseases are immediate results of dentition is without foundation. During active dentition, when the gums are distended and swollen from pressure, relief will often be furnished promptly by rubbing through the prominent points of the tooth with a clean towel over the index-finger. Lancing alone may be performed, but unless the tooth is well advanced, it is quite possible that the gums will reunite over the tooth, forming a cicatrix which will make the eruption more difficult than before. If a week or ten days' discomfort can be obviated by assisting a tooth through the gum, I fail to see any contraindication to such a procedure.

IV. DISEASES OF THE MOUTH AND ESOPHAGUS

SPRUE (THRUSH; MYCOTIC STOMATITIS)

The disease makes its appearance in the form of small white masses of about the size of a pin-head. The tongue and the inner sides of the cheeks are favorite sites for the growth, although in severe cases the entire buccal cavity may be studded, as though finely curdled milk had been scattered over the surface. The growth is firmly adherent, and its forcible removal produces slight bleeding. Sprue is invariably associated with uncleanliness, and occurs, as a rule, in weakly and marasmic nurslings and in the bottle-fed—more frequently in the latter. The disease is rarely seen after the sixth month.

Symptoms.—Thrush, soor, or mycotic stomatitis is due to Oïdium albicans, classified by Grawitz among the hyphomycetes. This fungus consists of budding, yeast-like cells which form hyphæ from which spores are developed. The latter form only under favorable cultural conditions, and preparations made directly from the white patches on the buccal mucosa, as a rule, show only the budding cells. Sections through the mucous membrane, on the other hand, clearly show the threads.

An infant with this disease gives evidence of much pain and discomfort while nursing or while feeding from the bottle. Active gastro-enteric disturbances, such as vomiting and diarrhea, may be associated with sprue, but such association is not the rule. Time and again I have seen cases in which there were absolutely no other signs of the disease than the characteristic mouth lesions and the patient's refusal of food. The average case may easily be cured in a week if treatment is carefully carried out. Sprue is not contagious, and if the means of prophylaxis, which will be suggested, are used as a part of the daily routine, the disease will never appear.

Treatment.—If the patient is breast-fed, the mother's nipples must be washed with a saturated solution of boric acid and moistened with alcohol, diluted one-half, which is allowed to evaporate before each nursing. If the infant is bottle-fed, both nipple and bottle should be boiled after each nursing, and the nipples turned inside out and scrubbed with borax water—one ounce of borax to a pint of water. In either case the mouth should be washed with a saturated solution of boric acid after each feeding. For this purpose a generous amount of absorbent cotton loosely wrapped around the clean index-finger of the mother or nurse is placed in the cold solution, and then, without expression of the water, introduced by the finger into the child's mouth. In case of sprue, the application should be brought gently into contact with the diseased parts, first on one side and then on the other, and finally pressed over the tongue and under the tongue. It is well to

have the child rest on the side or abdomen so that the fluid which is pressed out by the manipulation of the cotton against the cheek and jaws can readily escape from the mouth. The washing, which really amounts to an irrigation, can be done in a few seconds, without the slightest danger of abrading the epithelium. In obstinate cases this treatment may be supplemented by penciling once a day with 1 per cent. solution of formalin.

Internal medication is of no value except as a means of correcting any intestinal derangement that may exist, with a view to improving the general condition. If the bottle or breast is refused, spoon-feeding, for a few days, may be found necessary, and in any event will hasten the cure. If the child is nursed, the mother's milk may be drawn with a breast-pump (see p. 36) or pressed out with the fingers and then fed by the spoon. The domestic remedy, honey and borax, should not be used in treating any of the inflammatory diseases of the mouth in children.

STOMATITIS

The term *stomatitis* is applied to an inflammation of the mucous membrane of the mouth. Three types are usually described by pediatric authors—the *catarrhal*, the *aphthous*, and the *ulcerative*. This division is perhaps more the result of the habit of copying from former writers, than of clinical observation. Among several thousand out-patient, institution, and hospital patients, it has been my privilege to treat many cases of stomatitis.

There are many cases of catarrhal stomatitis which, under treatment, go no further; other cases, with or without treatment, go on to the development of aphthæ, or to an ulcerative condition. Both conditions may be combined. Many cases, when they appear for treatment, have the so-called aphthous spots already developed, but the condition described as "catarrhal stomatitis" also is present. Other cases when they come to us show marked ulceration, but never without catarrhal symptoms.

Bacteriology.—Catarrhal, aphthous, and ulcerative stomatitis have no specific bacteriologic etiology.

Etiology.—The cause of the disease is unquestionably an infection, and there is no doubt that it is contagious. As to the nature of the infection, positively nothing is known. The combined action of several varieties of microörganisms is the most plausible explanation. I have known stomatitis to go through an entire family of several children. Authors are prone to attribute the trouble primarily to mechanical irritation, such as careless manipulation during the mouth toilet; but the majority of my cases when they applied for treatment had never been accustomed to mouth toilets of any kind. The giving of overheated food is supposed by some to be a causative agent. If this were the case, 75 per cent. of the infants among the poorer classes would never be free from the disease. The food of bottle-fed children unless carefully watched is almost invariably given too hot. The disease, however, is not limited

to dispensary patients. I have seen many cases among the well-to-do. Where gross uncleanliness is the family habit, the number of cases of stomatitis will, for obvious reasons, be greater; there are more bacteria to carry infection. Children whose mouths are carefully cleaned after each feeding do not develop stomatitis. To teach that a child's mouth should not be washed because an indifferent doctor may fail to instruct the mother or nurse as to how it should be done is rank heresy. When errors of the mother or nurse occur in performing the various offices for the child, it is my observation that, nine times out of ten, the fault is due to lack of teaching by the physician. The mouth may be very effectually cleansed without injuring the mucous membrane in the slightest degree.

Symptoms.—The first symptom of a stomatitis is a superficial catarrhal inflammation of the mucous membrane of the mouth. There is a redness and injection of the gums. If "aphthæ" develop, small grayish plaques appear on the mucous surface of any portion of the buccal cavity. In mild cases there may be but three or four areas. In a case of moderate severity the mucous membrane of the gums, the hard and soft palate, and the inner side of the cheeks will be studded with ulcerated, grayish-white areas, varying in size from a pin-head to a split-pea. Occasionally the areas coalesce, forming larger plaques of a serpiginous type.

Ulceration, which ordinarily does not appear until after the catarrhal condition has been present for at least three or four days, will first be noticed as a faint yellow line at the margin of the gum where it joins the teeth. This is the commencement of what Virchow describes as "necrobiosis." Ulceration never occurs unless teeth are present. I have never known a case to go on to ulceration in a baby fed entirely at the breast. Whether the case remains simply catarrhal, or whether aphthæ or ulceration or both result, certain symptoms are common to all. There is a marked increase in the flow of saliva, which, in some cases, may be said to stream from the mouth, running down over the chin and soiling the clothes. On account of its acid properties it causes an irritation of the skin and even an eczema. The mouth is hot and painful. Fever is present in a slight degree, both when the condition is simply catarrhal and when aphthæ are present. There is but little prostration and the child appears but slightly indisposed. In cases which go on to ulceration, the fever may be very high. I have frequently seen it 104° F. or over. In one case it reached 107° F. No cause except the ulcerative stomatitis could be found for the fever. Under properly directed treatment this child recovered in a few days.

On account of the pain occasioned by drawing on the nipple, nutrition may be considerably interfered with. The child takes the breast or bottle greedily, draws a few times, stops, and begins to cry. If he is urged to try again, the behavior is repeated. The pain appears to be particularly severe when aphthæ are present. The advent of ulceration will be indicated by a change in the breath, which becomes disgustingly foul. The gums are thick, spongy, and bleed easily, and in some

cases overlap the teeth very early in the ulcerative stage. If a case has been neglected or improperly treated, which was the history of not a few of my dispensary patients, the ulceration is often so extensive that the teeth become loose as a result of the destruction of the gums, and their removal is necessary. Strong, vigorous children are as susceptible to the disease as are the rachitic, the badly fed, or the generally delicate.

Prognosis.—The prognosis is good. All cases recover if seen early and if properly treated. Loss of teeth may result in those seen when the process is well advanced.

Treatment.—*Mouth-washing.*—When the stomatitis is catarrhal or aphthous, preventive treatment—the washing of the mouth after each feeding with a saturated solution of boric acid in boiled water—is also curative. A baby's mouth should be washed as follows: The child is placed on its side or on its stomach, the index-finger of the mother or nurse being thoroughly wrapped in absorbent cotton. The finger is then dipped into the solution, and without expressing the fluid it is placed in the child's mouth. By gentle pressure upon the gums and cheeks a sufficient amount of the fluid will be expressed to run out of the mouth and effectually cleanse it. The washing is assisted by the opposition offered by the child to the manipulation of the tongue, cheeks, and jaws.

Drugs.—Internal medication is of no value except indirectly. If there is a disordered digestive tract, it should receive attention by diet and saline laxatives. Calomel should not be given. Whether the condition was catarrhal or aphthous, I have never found it necessary to use other means than the free mouth-washing. Astringents and caustics have never been necessary. The cases usually recover in from four to seven days, under strict attention to cleanliness as regards the feeding apparatus or the mother's nipple, together with the free use of the boric-acid solution as a mouth-wash.

Feeding.—The food problem is oftentimes a difficult one to deal with, particularly in the case of nurslings, on account of the pain caused by drawing on the nipple, the child refusing absolutely to nurse. In some cases it may be necessary to draw the milk with a breast-pump, and for a day or two feed the baby with a spoon. With the bottle-fed, spoon-feeding may also be resorted to. The child will take the nourishment much better if it is given cool. Small pieces of ice and teaspoonful doses of cold water are taken eagerly.

Treatment after Ulceration.—With the development of ulceration a change in the management is necessary, both as regards a mouth-wash and the necessity for internal medication. Among the local measures hydrogen peroxid as a mouth-wash, one part of a 3 per cent. solution in two parts of water, used after each feeding, has given the best results. Such means, however, are rarely necessary if the case is seen early. I never employ other than the usual means of cleanliness—the boric-acid solution—except in cases that show a considerable destruction of tissue.

Chlorate of Potash.—In the internal administration of chlorate of

potash we have what is practically a specific in this disease. Its administration should be commenced as soon as the condition is recognized. I usually prescribe it in the syrup of raspberry, using one part of the syrup to two parts of water. For a child under eighteen months of age I order two grains at intervals of two or three hours—not more than ten grains in twenty-four hours; for a child from eighteen months to three years of age, two or three grains at the same intervals, not more than fifteen grains in twenty-four hours. With the above dosage it will be necessary, in the average case, to continue the drug from three to five days. Very often, after the improvement is well marked, I reduce the dose one-half and continue it for three or four days longer.

Dangers of Chlorate of Potash.—Much has been written concerning the danger of the internal use of chlorate of potash in children, particularly in relation to its effects upon the kidneys. If the use of the drug in suitable doses were of special danger in this respect, the free use of the chlorate of potash and iron mixture, so extensively prescribed in diphtheria in the pre-antitoxin period, would have been universally condemned. I have never seen any unpleasant effects from chlorate of potash given in doses of 10 to 20 grains daily, and I have used it in many hundreds of cases of acute inflammatory conditions of the throat and mouth.

CANCRUM ORIS (NOMA)

No single microörganism has been proved to be the cause of noma. Spirilla and fusiform bacilli have been found (Weaver and Tunnicliff), not only in the necrotic tissue, but in the surrounding healthy parts. Whether these organisms represent the primary cause of the lesion or only secondary invaders is not known. In other instances the Bacillus diphtheriæ has alone been found. The nature of the lesion points to the action of a specific infection.

Symptoms.—The site of the disease is usually the inner side of one or both cheeks. The gangrenous process usually begins as a small, inflamed, infiltrated area in the mucous membrane opposite the teeth. Localized destruction of tissue follows, and this process extends with great rapidity until the tissue sloughs away in masses. The parts for some distance around the ulcer become hard, infiltrated, and discolored, presenting an inflamed, edematous look. After two or three days a discolored, ecchymosis-like area may be noticed on the outer side of the cheek, corresponding in location to the gangrenous process within. At this point the ulcer soon perforates. The destruction of tissue continues quite symmetrically around the ulcer until the whole cheek is destroyed. The gangrenous process not infrequently involves the bony structure, causing necrosis of the jaw, with loosening and falling out of the teeth. A symptom which will never fail and can never be forgotten by one who has seen even one of these cases is the almost unbearable stench which emanates from the patient. When the hands or the fingers of the physician or nurse come in contact with the gangren-

ous slough, it is almost impossible to remove or neutralize the disgusting odor. The disease usually occurs in weakly, marantic children, who die, ordinarily, from exhaustion and sepsis within ten days or two weeks from the onset of the disease. Hemorrhage is rarely a complication. The disease is usually fatal, even under the best management.

Treatment.—The treatment pursued has consisted in the use of free cauterization with nitric acid, chemically pure, and the application of disinfectant wet dressings of bichlorid 1:2000, saturated solution of boric acid, or equal parts of alcohol and water. The dilute alcohol is apparently more effective in staying the progress of the disease than is either the bichlorid or the boric-acid solution. On account of its rapid evaporation, the alcohol should be applied on two or three layers of lint and covered with rubber tissue. Even then frequent renewals are required. Hydrogen dioxid may be used to cleanse the ulcer, both before and after perforation.

FISSURES OF THE LIPS

Deep cracks and fissures in the lips are of quite frequent occurrence among children. Usually the lower lip is involved, and in many of the cases there is but one deep fissure and that at about the middle of the lower lip. Marasmic, ill-conditioned children are the most frequent sufferers. The fissures bleed easily and occasion considerable pain during nursing. As a result, less food is taken than the child requires.

Treatment.—If the fissure is deep, a 50 per cent. solution of nitrate of silver should be applied at the commencement of the treatment. This is to be followed by frequent applications—three or four times daily—of a 25 per cent. solution of ichthyol. Healing is usually prompt, requiring but a few days. If the mucous membrane of the lip generally is dry and fissured, as in cases of prolonged illness with fever, the frequent use of a 5 per cent. boric-acid ointment, made with cold-cream as a base, will be of material assistance in controlling the condition.

GEOGRAPHIC TONGUE

The condition known as a "geographic tongue" consists of distinct, smooth, reddish patches on the tongue's surface, surrounded by a light grayish, narrow, raised border. The smooth surfaces comprising the involved areas are devoid of epithelium; the borders are composed of hypertrophied papillæ which take on a grayish color, making a distinct framework for the reddish areas, which are almost always crescentic in shape. This peculiar marking has given rise to the term "ringworm of the tongue." Geographic tongue is seen most frequently in children under three years of age, and occurs as often among the strong and vigorous as among the delicate and weakly. The condition is usually discovered by the mother, who, with much agitation, brings the child to the physician. It does not appear to be due to and is usually not associated with any disturbance of the gastro-enteric tract. That portion of the tongue which is not involved appears perfectly normal.

Treatment.—Treatment of geographic tongue is unnecessary, as the

condition causes no symptoms and apparently is independent of any disease. It is my custom to assure mothers that the condition is of no consequence. It usually disappears in a few months. I have known a case to last for a year.

ULCERATIONS AND FISSURES AT THE ANGLE OF THE MOUTH

Ulcerations and fissures at the angle of the mouth are by no means uncommon in delicate and marasmic infants. While ulceration in this location is one of the manifestations of congenital syphilis, such ulcers are not necessarily syphilitic. The condition, however, is of sufficient importance to require treatment, because the affection is so painful as to prevent the taking of adequate nourishment. Painting the fissure with a 25 per cent. solution of ichthyol every three hours during the day will insure prompt healing.

HARELIP AND CLEFT-PALATE

Harelip is a vertical cleft in the upper lip resulting from arrested embryonic development. This defect may or may not be associated with cleft-palate, and varies from a slight indentation in the border of the lip to a deep fissure, which may be bilateral, extending into the nostril, and complicated by non-union of the palate. In any case the deformity will be easily understood if we recall that the normal development of the face depends upon the union of the central or frontonasal process with the two lateral superior maxillary processes. Posteriorly, this union is completed in the median line of the palate, and anteriorly, on either side external to the incisors, in the soft parts beneath the nostril.

Etiology.—The malformation is more frequent in males than in females, and in some instances can be ascribed to heredity. Not infrequently, with cleft-palate, other congenital defects coexist. The true cause of the arrest in development is unknown.

Varieties.—Both harelip and cleft-palate may be complete or incomplete, unilateral or bilateral. When the harelip is double, cleft-palate also almost always exists. Medium harelip occurs exceptionally.

Symptoms.—The character of these deformities is wholly apparent. In the simple forms of harelip the disadvantages may be merely cosmetic. When there is a cleft in the palate, however, suckling will be interfered with, deglutition will be difficult, and if the child goes untreated and survives, articulation will be imperfect.

Treatment.—The treatment of both harelip and cleft-palate is essentially surgical. The former defect, if uncomplicated, may usually be satisfactorily obliterated by an operation of the König or Nélaton type. Cleft-palate offers more serious obstacles. Brophy secures an approximation of the edges of the cleft by the gradual tightening of silver-wire sutures traversing two lead plates, each of which is fitted to the lateral portions of the alveolar arch. The operation on the soft parts is deferred until the child is fourteen to eighteen months of age. When the cleft is small, this procedure may be excluded in favor of a more direct method. An operation during the first months of life

involves considerable risk, but offers better possibilities for good development of the nasopharynx than an operation deferred until the third or fourth year, after the growth of the teeth. The appropriate course to adopt in any case should, therefore, be left to the surgeon.

In young infants with cleft-palate, spoon-feeding or gavage is frequently necessary. Good results in some cases are reported to have followed the use of a special nipple with a flange on either side, designed to bridge over the fissure in the palate.

MALFORMATION OF THE ESOPHAGUS

Malformation of the esophagus is of infrequent occurrence, and when present, is usually accompanied by other congenital deformities. In most instances the differentiation of the esophagus from the trachea and bronchi, in the metamorphosis of the embryonic foregut, has been incomplete.

The list of possible abnormalities includes the following:

(*a*) Total absence of the esophagus.

(*b*) Diesophagus, involving partial or complete reduplication of the esophagus.

(*c*) Esophagotracheal fistula, with or without obliteration of the lumen of the esophagus in a portion of its extent.

(*d*) Division of the esophagus into upper and lower non-communicating pouches.

(*e*) Congenital stenosis.

(*f*) Congenital dilatation.

The symptoms caused by these conditions depend on the obstacles opposed to deglutition. Regurgitation of food and accumulated mucus is constant, accompanied by suffocative attacks due to the entrance of material into the respiratory tract. Congenital dilatation above the diaphragm may produce the symptom of rumination.

In a large majority of the cases, congenital malformation of the esophagus results in death before the tenth day from asphyxia, aspiration pneumonia, or starvation.

Gastrostomy offers the only possible means of prolonging the patient's life, till surgery directed at the primary defect can justifiably be attempted.

An autopsy on an infant a few days old referred by me to the Babies' Hospital showed that the trachea communicated with the esophagus just above the bifurcation.

The esophagus was normal at its upper portion, dilated lower down, and formed a blind diverticulum which ended below the level of the tracheal bifurcation. Above the diverticulum the esophagus communicated with the trachea through an opening in its anterior wall. Below the diverticulum the esophagus was smaller in caliber than normal, but it was pervious and communicated with the stomach. A probe could be passed upward through the esophagus into the pharynx.

V. DISEASES OF THE STOMACH, INTESTINES, AND PERITONEUM

THE STOMACH

Anatomy.—During fetal life the position of the stomach is almost vertical, at birth slightly oblique, the obliquity increasing with age. At birth the stomach is almost cylindric, and, according to Pfaundler, between the time of birth and the seventh month the fundus of the stomach increases to fully twice its original length, so that at about the end of infancy the stomach lies in a somewhat oblique position, passing from behind forward and downward. The diaphragm is penetrated by the esophagus at about the level of the ninth dorsal vertebra, while the cardia is about on a level with the tenth. The pylorus, though usually situated in the median line, may occasionally be found to the right of it.

Capacity.—The capacity of the infant's stomach is, even up to the present day, a subject of more or less speculation, due, no doubt, to the fact that during life aspirations are unreliable on account of the fact that food passes almost immediately into the duodenum, and methods of experiment on the cadaver require an amount of pressure (14 to 30 c.c. of water) that does not exist in the normal state during life. The stomach undergoes a systolic contraction after death, and thus the distention with fluids is artificial.

The absolute capacity, according to Holt, Rotch, Pfaundler, and Fleischmann, varies, depending on the method of examination employed. According to Holt's observations, based on postmortem examinations of 91 infants, the capacity at birth is 1½ ounces; at three months, 4½ ounces; at six months, 6 ounces; at twelve months, 9 ounces.

Gastric Digestion.—Digestion in the stomach is not so important in the infant as in the adult. The function of the infant's stomach is mainly that of a reservoir, the digestive processes being only preliminary. The principal change in the milk, so far as the stomach is concerned, occurs in connection with the casein curd, and up to the present time it is well established that protein digestion in the stomach does not go beyond the stage of peptone formation. Pepsin is found in large amounts in the infant's stomach, and, according to some observers, occurs as early as the fourth month of fetal life. The reaction of the stomach-contents is usually acid inside of fifteen minutes after ingestion of food, but free hydrochloric acid is not present till thirty or forty-five minutes after, the reason being that hydrochloric acid combines with the casein and milk salts.

The coagulation of milk, which is the first change that it undergoes, is brought about through the agency of the rennet ferment. The casein coagulum of cow's and of human milk is essentially different, the former

being a firm mass, containing in its meshes the fat of the milk, the latter being in fine flocculi, with little of the fat of the milk, and readily acted on by the stomach-juices. Due to the influence of pepsin and hydrochloric acid, solution of the coagulum begins; this occurs more rapidly in woman's milk on account of the lower casein content and the small size of the curds. During the first half-hour the fluid portion or whey begins to leave the stomach, and at this time a considerable portion may be found in the intestine, and at the end of an hour in a young infant the stomach may often be found empty. In a bottle-fed baby the coagula are larger, solution is retarded, and consequently the food is retained longer. If the milk is boiled, solution is more rapid and gastric retention lessened. Some observers believe a fat-splitting ferment to be present, but this, if present, plays but a small rôle in digestion.

Motility.—The duration of digestion varies of necessity with the age of the infant and the composition of the food. In general terms it may be stated that in breast-fed infants digestion is completed in one and one-half to two hours; in artificially fed infants taking raw milk, in about one to two hours longer; and in those taking boiled milk, in a little less time.

Cannon has shown that an acid reaction of the contents of the pyloric portion causes the pylorus to open, while an acid reaction in the duodenum causes it to remain closed. After the coagulation of the casein of the milk the whey is readily acidified and passes the pylorus first, together with the carbohydrates. As the proteid requires a longer time to combine with the acid of the stomach it is some time before free acid is present, and the exit of the proteid from the stomach is, therefore, delayed. The fatty acids and neutral fats are the last to pass the pylorus, because of the longer time required for the fatty acids to be neutralized by the duodenal secretions; and the pylorus, therefore, remains closed because of duodenal activity. The opening and closing of the pylorus, according to these investigations, depends chiefly on the reaction of the gastric contents, which is the most vital factor in the motor activity of the stomach.

ACUTE GASTRITIS AND ACUTE GASTRIC INDIGESTION

Not a little confusion exists respecting the differentiation of acute gastritis and acute gastric indigestion. Cases of gastric indigestion are often diagnosed as gastritis. In fact, acute gastritis in children is a very rare condition, while acute gastric indigestion is very frequent. Acute gastritis in the young is usually due to the ingestion of corrosive or irritant drugs. Food, unsuitable in character or quantity, or food which may have undergone chemical or bacterial change, may produce pronounced vomiting, usually transient in character. Inflammation of the mucous membrane of the stomach may be produced in this way, but according to autopsy findings it is most unusual.

Cases of persistent vomiting which are often diagnosed as gastritis not infrequently prove to be of cerebral or uremic origin, or due to some form of intestinal obstruction, or are cases of cyclic vomiting.

Autopsies on infants dying from acute gastro-enteric diseases, such as cholera infantum, rarely show any stomach lesion, although there may have been persistent vomiting for two or three days.

Acute Gastric Indigestion.—Acute gastric indigestion is manifested in sudden repeated vomiting, often with fever, always with prostration, and with apparent disgust for food. The temperature may be high—104° to 105° F.—or normal throughout. After a few hours there will often be evidence of bowel disturbance. The stools will be undigested, greenish in color, and contain a moderate amount of mucus. There may be moderate abdominal distention. In fact, the symptoms other than that of emesis are of a very indifferent character.

Treatment.—A high enema should always be given as the initial treatment in any illness of any nature in which there is acute vomiting with an absence of free bowel action. If the vomiting is continued, the management of the case, regardless of the exciting cause, is to wash out the stomach at least once and to give no food by mouth. If the case is of more than twelve hours' duration in an infant or twenty-four hours' in an older child, colon flushings should be carried out to supply fluids to the organism (p. 763). A means of much value, both in infants and in older children, which I use with great frequency, is a solution of bicarbonate of soda, 5 grains in 6 ounces of water, given hot in teaspoonful doses at intervals of a very few minutes.

Diet.—After twelve or twenty-four hours' abstinence from food, small quantities of water or some very weak food may be given tentatively if the child craves it. Whey, milk, barley-water, weak tea, chicken or mutton broth, may be tried in teaspoonful doses every half hour. Usually cold foods will be retained better than those that are heated. If the food or water is rejected, a further stomach rest of from eight to twelve hours may be ordered before the feeding is resumed.

Treatment of Protracted Cases.—In the protracted cases, the stomach should be washed, at least once daily, with a 5 per cent. solution of bicarbonate of soda. It is never wise, in the event of vomiting, to attempt forced feeding, as nothing will be gained; in fact, the vomiting may be continued indefinitely, and chronic gastric indigestion established, as a result of injudicious attempts at feeding. For the persistent vomiting of infants, gavage (p. 758) may also be used. I have employed this successfully in a great many cases of persistent gastric indigestion with vomiting. A food which is rejected when swallowed will oftentimes be retained when put into the stomach through a tube. If nourishment cannot be retained after thirty-six hours, when given by the natural method or by gavage, it is best to begin feeding by the bowel, using completely peptonized milk, at intervals of from six to eight hours, in quantities of from two to four ounces for young infants and from six to twelve ounces for children from eight to ten years of age. Applications of heat or counterirritation over the stomach area have been of very little service. I have treated hundreds of these cases of acute indigestion with different forms of medication, including calomel, small doses of ipecac, oxalate of cerium, opium, etc.,

and have been far more impressed with their uselessness than with their beneficial influence. Drugs oftentimes get credit to which they are not entitled for the improvement of the patient. A child has an acute attack of indigestion with repeated vomiting. He is, perhaps, given an enema, his food is stopped, a certain drug is given in small quantities of water, he recovers, and the drug gets the credit. He probably would have recovered more quickly without the drug. As a rule, the use of drugs, or even a small quantity of water, when given early, will prolong the attack.

An enema, the recumbent position, and the withholding of food, with nourishment or fluids, such as normal salt solution, by the bowel, have given me my best results. When the child craves food and asks for water after an abstinence of several hours, feeding may be tried, but the fact that he asks for it is by no means a guarantee that what is given will be retained.

Treatment of Persistent Vomiting.—In pronounced, urgent, frequent vomiting, morphin hypodermically may be required. The morphin should be guarded by atropin and given in doses of $\frac{1}{50}$ to $\frac{1}{40}$ grain for a child one year old, to $\frac{1}{10}$ grain for a child from eight to twelve years old. The relation of the dose of morphin to that of the atropin should be as 1 is to $\frac{1}{200}$. Thus, a child who is given $\frac{1}{30}$ grain morphin should have combined with it $\frac{1}{6000}$ grain atropin; with $\frac{1}{10}$ grain morphin there should be given $\frac{1}{2000}$ grain atropin.

It will rarely be necessary to repeat the morphin more than once, two injections being given at intervals of from four to six hours. In all cases the usual feedings must gradually be resumed. A trial of different foods will soon show which will best be retained.

CHRONIC GASTRIC INDIGESTION (CHRONIC GASTRITIS)

Chronic gastritis is seen most frequently in comparatively young infants, and is often associated with, or is a cause of, marasmus and malnutrition.

Symptoms.—Vomiting and regurgitation of food are the predominant acute manifestations of the disorder, which, untreated, interferes seriously with the nutrition of the patient. The condition is almost invariably a result of slight but persistent errors in feeding—errors too small to make the child violently ill, but sufficient to keep the stomach in a constant state of unrest.

Pathology.—The lesions in these cases are insignificant. There may be some superficial, localized congestion at the pyloric end of the stomach—there may be destruction of the superficial epithelium and infiltration of the mucosa with round-cells.

Treatment.—The management consists in daily stomach-washings, sometimes for a long period, and an adaptation of the food to the child's digestive capacity (p. 70). While there is no one way of feeding these cases, a food of greatly reduced strength must always be given, particularly when cow's milk is used. As a rule, these children have a low fat capacity—not more than 1.5 per cent. can usually be

taken. Sugar is also badly borne by many of these infants and must be given in reduced strength—from 3 to 4 per cent. only. Usually the proteids are fairly well taken care of if the function of the stomach is not compromised by too much fat and sugar. In cases of children under nine months of age, a wet-nurse may help solve the problem. On beginning with the wet-nurse, however, the child should not be allowed to get over one or two ounces at a nursing, lest the fat in the milk continue the trouble. The remainder of the feeding is given by the bottle. Granum-water or barley-water No. 1 (see p. 140) may be used in quantity sufficient to bring up the amount to the number of ounces required.

Dilatation of the stomach is usually present, and motor inactivity necessitates stomach-washing, which may be required for several months at gradually decreasing intervals. Details of the treatment, which relate largely to feeding, would necessitate a repetition of what has been said in the chapter on Malnutrition, Marasmus, and Food Adaptation, to which the reader is referred.

It is to be remembered that in these cases the feeding interval is important, regardless of the age. Because of motor inactivity, the stomach requires a longer time than the normal to empty its contents into the intestine.

CHRONIC DILATATION OF THE STOMACH

In children of any age the stomach capacity may be found greatly increased. I have seen the holding capacity increased to two or three times the normal. Bottle-fed infants under one year of age furnish most of the cases.

In the absence of pyloric stenosis (p. 191) the persistent feeding of too large quantities of food at frequent intervals is the cause. It is not at all infrequent, in cases of malnutrition and athrepsia, to find the patients taking at every feeding from two to three ounces above the normal stomach capacity for children of their size and weight.

Symptoms.—Infants with dilated stomachs almost invariably suffer from indigestion, usually with the vomiting of milk curds and mucus, the vomiting generally taking place a considerable time after the feeding, and becoming habitual. In marasmus and in the various forms of malnutrition the stomach is usually more or less dilated.

Treatment.—Often, in these cases, the nourishment that has been given is of the proper strength, and all that will be required is to reduce the quantity allowed and perhaps decrease the frequency of the feedings. The stomach should be washed daily if the child does not respond to the simple reduction in the amount of fluid. Particularly is the stomach to be washed if there is a tendency to fermentation in the stomach-contents, evidenced by the presence of gas in the stomach and frequent eructations of sour, undigested food and mucus. The food should contain a low fat and a moderate amount of sugar. A reasonably high proteid may usually be given. Because of the tendency to fermentation, these cases do badly on the gruel diluents also, and these,

if they have formed a part of the child's diet, are to be discontinued. Small doses of bismuth subcarbonate, 3 grains, bicarbonate of soda, 2 grains, benzoate of soda, 1 grain, two hours after each feeding, have a decidedly beneficial effect. Hydrochloric acid should not be given, and pepsin is unnecessary.

Dilatation in Older Children.—Dilatation of the stomach after the eighteenth month will be found due to the same cause, overfeeding; or the condition may have persisted from earlier infancy. At this age dilatation is seen most frequently in children who take large quantities of milk with their regular meals. Milk, which is no longer a necessary part of the diet, may now be replaced by more concentrated food, such as meat, eggs, and cereals in moderate amount. Not over four ounces of fluid should be given with any one meal. The habit of drinking with meals is best broken by encouraging the child to drink between meals. One hour before each feeding he should be given eight ounces of water. It should be given cool, not cold, at a temperature of from 50° to 60° F., and should be drunk slowly. It is considered particularly necessary to give water one-half hour before the first meal of the day. In my estimation it is equally important to give it before *each* meal.

HEMORRHAGE FROM THE STOMACH; VOMITING BLOOD

With the exception of hematemesis in the newly born, the vomiting of blood by infants has been due, in my experience, to ulceration of the stomach (p. 190), to purpura fulminans (Henoch's), or to accidental causes. In two of my proved cases, extensive ulceration of the stomach was found at autopsy. A boy six years of age died on the third day with purpura fulminans. There were profuse hemorrhages from the stomach, from the mucous surfaces, and under the skin. Accidental sources include the swallowing of blood, which may take place as the result of a nasal hemorrhage, or from a blow or fall causing injury to the nose or mouth, or from the presence of a foreign body in one of the nostrils. Injury to the pharynx also may be followed by hemorrhage sufficient to cause vomiting if the blood is swallowed. A case of hematemesis in a well-nourished breast-fed infant five months of age gave me a great deal of anxiety. The vomiting of blood continued for several days without the slightest evidence as to its source. This occurred two or three times a day, usually shortly after nursing, the quantity of blood being especially large after the early morning nursing. There were no cracks or fissures in the mother's nipples, nor could blood be made to exude from any portion of the nipples on reasonably strong pressure. Convinced, nevertheless, that the source must be the breast, I applied a breast-pump, making use of as strong suction as possible, and obtained milk with a large mixture of blood. Evidently there had been a rupture of some of the smaller blood-vessels in the gland behind the nipple. At the first nursing the child was very hungry and tugged vigorously at the breast, which doubtless explains why the early morning vomiting showed the most blood.

In hematemesis in the newly born the patient should have the ad-

vantage of the human serum treatment (p. 173). In other cases calcium lactate, 5 grains every two hours, or adrenalin, 1:1000 solution, in 5-drop doses, should be given. The patient should be kept very quiet and given no food, rectal feedings (p. 121) being relied on to sustain strength.

ULCERATION OF THE STOMACH

Ulceration of the stomach is usually associated with marked gastric disturbance, such as occurs in gastritis and in the different forms of malnutrition.

Notwithstanding a large autopsy experience among infants and young children, I have as yet to see a perforating ulcer, tuberculous or of other type. In fact, aside from those in the newly born I have seen at autopsy only two cases of ulceration. In three other cases the diagnosis of ulceration was made because of hematemesis. A child one month old repeatedly vomited blood, and eventually bled to death. At autopsy about two ounces of coagulated blood were found in the stomach. The gastric mucous membrane was the seat of many ulcers, varying in size, none exceeding $\frac{1}{16}$ inch in diameter. Another patient, three months old, had chronic gastro-enteritis with occasional vomiting of blood and died from exhaustion, the autopsy showing multiple small ulcers in the mucous membrane of the stomach. That ulcerations, even of a mild degree, play any great part in the digestive disorders of infants and young children is disproved by the infrequency of the lesion at autopsy.

In treating cases of gastric disorders by stomach-washing it is comparatively rare to find blood in the water siphoned off. At rare intervals the water may be tinged with blood, but the washings invariably should be continued in spite of this, as I have never known any severe hemorrhage to follow. The blood which appears under these conditions is doubtless from the capillaries of the congested mucous structure, which are distended as a result of strain.

Treatment.—In the event of persistent vomiting of blood of small or large amount, which cannot otherwise be accounted for, the walls of the stomach are to be regarded as the source of the hemorrhage. Under these conditions oral feeding should be discontinued and the nutrient enema (p. 121) should be brought into use. Bromid and chloral, or stimulants if necessary, may thus be given with the food. Suprarenal extract in one-grain doses should be given hourly and continued for twelve hours after the vomiting ceases. After thirty-six hours water may be given in small amounts; and the usual milk mixture diluted one-half, in small quantities of two or three ounces, may also be allowed. The normal diet should not be resumed in less than a week, even in the event of an entire absence of vomiting during this period.

THE MANAGEMENT OF VOMITING BABIES

The baby who habitually vomits or regurgitates his food is one of the most troublesome patients with whom we have to deal.

In such cases the possibility of existing pyloric stenosis must be excluded. My best results, in feeding these habitual vomiting children, have been gained by the use of cereal decoction and a fat-free milk. One ounce of barley-flour to the pint of water is cooked for thirty minutes, and water added to make one pint at the completion of the boiling. The child is fed one-third skimmed milk to two-thirds barley-water, or one-half skimmed milk to one-half barley-water, depending upon the patient's age and condition. Unless the child is very young, the interval between feedings should be three hours or longer, and he should be kept absolutely quiet for one and one-half hours after feeding. The handling and tossing about of the vomiting child is one of the best ways of keeping up the trouble. If constipation results from such a diet, magnesia in sufficient amount may be added to the daily ration.

Stomach-washing.—Nearly all habitually vomiting children will improve more rapidly if they have a stomach-washing every day for a week, and every two or three days thereafter, as may be necessary. It is not to be expected that a patient will grow on the above diet. When the vomiting is controlled, the food strength may be advanced by the use of whole milk, and later by the addition of milk-sugar. The addition of 20 grains of bicarbonate of soda to the day's ration is of decided benefit in very troublesome cases.

By some infants fresh cow's milk will not be tolerated, even in very weak dilution. In such instances I have been successful in using an evaporated or condensed milk to which cane-sugar has not been added. From 1 dram to one-half ounce is added to the amount of barley-water given at one feeding. Such a milk is put up by the Borden Condensed Milk Co., and is known on the market as Peerless Brand Evaporated Milk. As the preservative, cane-sugar, is not a part of the preparation, the contents of a can may be used for only one day.

PYLORIC STENOSIS

That true pyloric stenosis is a congenital condition is accepted by most authors. There are three types of the disease in infants—the spasmodic, the hypertrophic, and the combined type.

Age and Sex Incidence.—In this disease the age is of great importance as a diagnostic point. Of 38 patients reported by Still, one began to vomit within twenty-four hours after birth and 6 others within the first week. Pfaundler found that the first vomiting indicating the onset of the disease was between the fourth and fourteenth days in 50 per cent. of the cases; from the second to third week in 25 per cent.; and from the third to sixth week in 25 per cent. In my own cases, 22 in number, the vomiting never appeared later than the sixth week. The symptoms may begin a few hours or days after birth, or they may not appear until the third or fourth week; occasionally not until the second month, and very rarely not until a later date, according to recorded cases. Instances of hypertrophy and stenosis of the pylorus coming on in adult life have been frequently recorded, and these may probably be due to a persist-

ence of the condition from early life. According to Ibrahim's investigations of 266 cases, the total number of cases shows a rapidly ascending curve in the first month and a reduced frequency with advancing age.

In the case of a baby five or six months of age, with a history of vomiting over a period of three or four weeks, the age alone is a factor against pyloric stenosis. In exceedingly rare cases seen in older children vomiting due to stenosis might be confounded with cyclic vomiting. Holt has seen one such case.

Sex.—No great stress is to be laid on sex in the diagnosis of this disease. The large number of male patients, however, contrasts remarkably with the corresponding small number of females. Out of a collection of 42 cases in which this point was noted, 35 were males (Still).

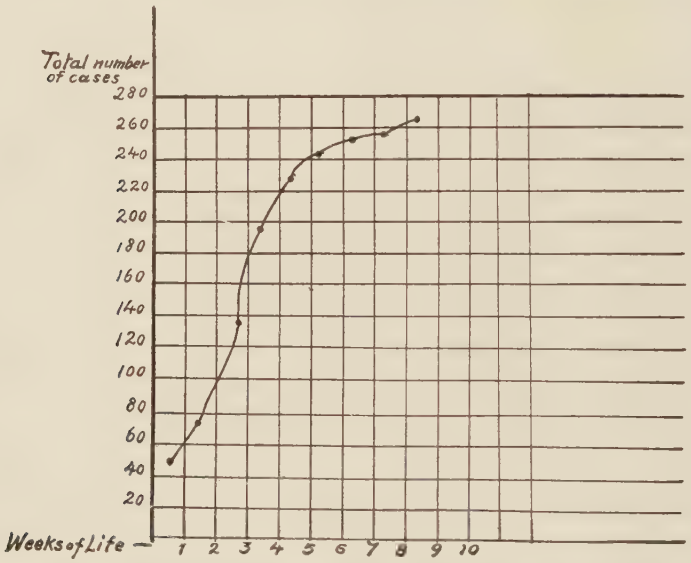


Fig. 17.—Drawn in accordance with Ibrahim's 266 cases (Pfaundler and Schlossman's System, 1912).

According to Ibrahim, males are affected about four times as often as females. Cases have been met with in the same family (Freund). Some authorities state that when the disease occurs in girl babies, it is usually of a mild form.

Etiology.—Pyloric stenosis is one of the diseases concerning which a great amount of theorizing has been done, especially in the early days, when few autopsy specimens were at hand. Most of the various surmises have been discarded, such as the probability of the stomach undergoing an agonal contraction, thus producing the thickening (Pfaundler). Many new views, however, have been offered, as the various names of the disease might suggest. Prominent, and among the most universally recognized, theories up to 1897 were those of Hirsch-

sprung and John Thomson. According to the former, the disease was due to a congenital organic defect, resulting from a primary pathologic hypertrophy of the pyloric wall, which constricted the lumen. Thomson contended that the essential lesion was not muscular, but primarily nervous: "A functional disorder of the nerves of the stomach and pylorus leading to ill-coördinated and therefore antagonistic action of their muscular arrangements." This latter view corresponds very closely to Still's theory of "stomach stuttering."

There is, to date, no convincing evidence that the spasm is set up by erroneous feeding or by hyperacidity. In 7 of 11 cases Feer found the total acidity varying from 50 to 105, and free hydrochloric acid from 0 to 50. Similar results have been obtained by other observers (Ramsey, Bernheim, Karo, Engel, Freund, Miller, Clark). Miller and Willcox (1901), in a series of carefully conducted investigations, attempted to show that pylorospasm may be due to hyperacidity, and that in hypertrophic stenosis, spasm, if present, is produced by some other cause. In hypertrophic stenosis hyperacidity is very common.

Of recent years most authorities have regarded the condition as primarily spasmodic, and probably due to gastric or duodenal irritation or nervous disturbances. According to this theory, the hypertrophy is secondary and depends to a large extent upon the degree of spasm. The possible existence of a certain amount of antenatal hypertrophy may be appreciated when one considers that the pylorus begins to form as early as the third month of fetal life. Such hyperplasia has actually been found by C. T. Dent in a seven months' fetus. Pylorospasm has its analogue in certain other spasmodic conditions of the circular fibers, such as constipation due to a spastic condition of the sphincter ani, and various allied conditions of the larynx and bronchi. By some observers, however, the essential condition in pyloric stenosis is regarded as a primary hypertrophy with secondary spasm.

Pathology.—The findings at postmortem are remarkably uniform. The alimentary canal below the pylorus is perfectly normal. The esophagus is sometimes noticeably dilated, sometimes of normal caliber.

The stomach is usually much dilated, the lower border being frequently below the umbilicus; the wall at the cardiac end is as thin as normal, but elsewhere much thicker, especially toward the pylorus. Occasionally the cardia may assist in the general hypertrophy. The pyloric part of the stomach consists of a rigid, resistant, cartilaginous mass of a bulging or nearly cylindric shape. The swelling appears like a separately interpolated insertion between the stomach and duodenum. When looked at from the duodenum, the pylorus seems almost closed, the mucous membrane being puckered by the contraction of the hypertrophied muscular wall, not unlike that of the os uteri. No fibrous stricture is present, and the whole narrowing seems to be due to compression by hypertrophied muscle. The tumor enlargement varies from 2 to 3 cm. in length, and from 1½ to 2 cm. in thickness. On section, the thickening appears to be due to the hypertrophy of the circular fibers, which may be two or three times their normal thickness. Finkel-

stein reports a case in which the thickening was due to an increase in the longitudinal fibers. The lumen varies in size. In some instances it barely admits a fine probe. Walbach, in one case, found the lumen 2 cm. in diameter. Occasionally a slight connective-tissue increase is found in addition to a slight thickening of the mucosa and submucosa. Catarrhal or inflammatory changes are usually absent. The test of functional potency by hydrostatic pressure is fallacious, for the redundant folds of mucous membrane may act as valves.

Symptoms.—Vomiting is the only active symptom of the stenosis, whether it is spasmodic or due to stricture. The history is usually that of an infant, apparently normal at birth, who remains well for two or three weeks or more. The child regains the early loss in weight, the stools are normal, and there is no suggestion of gastric disturbance. Then, without apparent cause, the child, whether breast or bottle fed, begins to reject the food. I have never known the vomiting to occur before the second week, except in spasmodic cases, in which vomiting may occur at birth, or perhaps not until after the eighth week.

Vomiting.—The vomiting may occur after each feeding. More frequently two or three nursings are retained and then a large amount is ejected, so that the nurse or mother is impressed with the large amount of vomiting, and volunteers the information that two or three feedings would be necessary to supply the large amount of food lost. In most cases the vomiting is forcible and decidedly explosive in character.

Constipation.—With the vomiting is associated constipation. The passages, previously full and normal, become very scanty, and are passed only upon rectal stimulation. Mucus is usually mixed with the feces. The degree of constipation depends upon the degree of permanency of the stricture. In the purely spasmodic cases considerable fecal material will be passed. A lesser amount will be passed in cases of the combined type.

Loss in Weight.—There is rapid loss in weight, as would be expected. I have repeatedly seen such infants reduced to mere skeletons.

Appetite.—These patients are voraciously hungry, and will take everything in the form of liquid food that is offered. Water will frequently be taken, as well as milk mixtures or the breast.

Absence of Other Signs of Illness.—There is no elevation of the temperature and there are no nervous phenomena. The urine is scanty and of high specific gravity, but shows no evidence of diseased kidneys. The child appears ill only on account of the wasting and moderate prostration.

Diagnosis.—In all young infants who develop persistent vomiting with constipation, or even persistent vomiting without constipation, the possibility of stenosis of the pylorus should be considered.

The Peristaltic Wave.—This sign consists of a rounded, circumscribed elevation of the abdominal wall, a lump from one to two inches in diameter, which forms at the left of the median line, sometimes appearing to rise from the margin of the ribs, and passes across the epigastrium (maintaining its original size in transit) to the right hypochondrium,

where it disappears. In a few seconds the phenomenon is repeated. Not infrequently, before the first wave disappears a second will form. I have seen cases in which the elevation and depression (see Fig. 18) were sufficient to involve the entire abdominal wall. The peristaltic wave described occurs in no other condition.

Method of Obtaining the Wave.—The wave may best be demonstrated after feeding. The stomach should not be overfull. If the usual feeding time is near, two ounces of food or water are given. If the child has been recently fed, before giving the food the stomach is washed out. The abdomen is then exposed, and usually before the child has finished the bottle the peristalsis will appear. Occasionally

Fig. 18.—Pyloric stenosis.

a case is seen in which no peristalsis will be elicited at the first examination.

The Tumor.—Palpation of the tumor through the abdominal wall is possible in some cases. I have not been as successful as other writers in demonstrating this conclusive sign. Thus Still was able to palpate the pyloric tumor in 41 out of 42 cases.

Palpation is aided by a partially filled stomach that is in active peristalsis.

Differential Diagnosis Between Hypertrophic Stenosis and Pyloric Spasm and Obstruction of the Combined Type.—The palpable pylorus may be looked upon as a *hypertrophic* pylorus. In a pylorus, moreover, that has undergone sufficient thickening to be palpable the connective-tissue changes are in all probability sufficient to necessitate operation. Constipation is always present in stenosis of the hypertrophic form. There is dilatation of the stomach, and the vomiting is persistent. In the *spasmodic type* the vomiting appears to occur

periodically—perhaps not oftener than once or twice a day. In some cases of simple spasm there will be no vomiting for a day or two, and during this time the stools will be fairly large. The short cessation will then be followed by a return of the repeated emesis. Cases of this type present the best chances for cure without operation.

In the *combined type*, in which there is moderate hypertrophy and spasm, the stenosis, when the stomach is at rest, is moderate in degree. It is possible for a considerable portion of the stomach-contents to pass into the intestine if but small quantities of food are given at one time. A private case which I expected would recover without operation represented this type. Vomiting occurred sometimes once a day—never more than twice. The active peristaltic wave was present. The stools were fairly large and well digested, from 10 to 15 ounces of food being retained daily. Without apparent cause, the child went into collapse and died. The autopsy showed a pylorus about $\frac{1}{16}$ inch in diameter, and revealed moderate thickening and hypertrophy of the circular fibers.

Alfred F. Hess,* of New York, finds the catheter (No. 15 F.) of much use in the diagnosis of pyloric stenosis. Under normal conditions the catheter readily passes through the pylorus. If there is stenosis, the catheter will not pass the pylorus. In cases of simple vomiting which may simulate stenosis the ready passage of the catheter proves the absence of stenosis.

Prognosis.—The prognosis is dependent upon many factors. The age of the patient and the severe nature of the surgical treatment are such that the operation of gastro-enterostomy will always show a considerable mortality.

The severity of the operation and the tender age of the subject are not the only reasons for the high mortality. Many of the patients when they come to the surgeon are so emaciated and reduced in vitality that operation simply hastens the end.

In surgical cases in children the surgeon should receive the consideration of counsel as to when and how long a condition may continue and still afford a good surgical risk.

Cases with Palpable Tumor.—These infants should be given the advantage of immediate operation. Of this there is not the slightest doubt. It is difficult for me to understand how physicians who have examined postmortem the thick, cartilaginous pyloric tissue, with its pin-hole lumen, can advise means other than operation.

The Spasmodic Cases.—There are probably comparatively few pyloric cases without involvement of the muscle structure. In such cases the prognosis is good, and all should survive.

In the combined cases of spasm and hypertrophy, which represent the largest number of cases, the prognosis is dependent largely upon the degree of hypertrophy and the management. Exclusive of operation, the management of the spasmodic and combined type is the same.

* Amer. Jour. Dis. of Children, vol. iii, p. 133.

Treatment.—The operation of gastro-enterostomy in the presence of a tumor; breast-milk diet to follow the operation.*

Postoperative Treatment.—Vomiting after operation rarely causes trouble. Regurgitation, which is troublesome, will occur in some patients. This may be obviated by bringing the force of gravity into use by elevating the head and shoulders of the patient on a high pillow. These children need fluid badly, and this may be supplied, during the first hours after the operation, by the "Murphy drip."

Three hours after the operation teaspoonful doses of water or breast milk may be given at one-half hour intervals. The amount given at one time should be gradually increased and the intervals lengthened. Three days after the operation the child should be receiving a fair amount of nourishment. If breast milk is not obtainable, fresh cow's milk or condensed milk, suitably diluted, may be used.

Palliative measures in the non-operative types:

First: Diet—breast milk from mother or wet-nurse. If breast milk is not available, suitably modified cow's milk given in weak dilution at first, and in small amounts, one teaspoonful every half-hour.

Second: Later the amount of nourishment and the feeding means must be determined in each case. If breast milk feeding is not possible, then a mixture of cow's milk, low in fat and sugar, or unsweetened condensed milk, may be given.

Third: The stomach should be washed daily with 5 per cent. bicarbonate of soda solution.

My best results have been obtained with fat-free plain milk or evaporated (unsweetened condensed) milk. The milk is diluted with a gruel, which adds to the carbohydrate content. In any case of pyloric obstruction the passage of fluids from the stomach is delayed. The presence of fat and sugar gives rise to irritating chemical changes in the contents of an organ already inclined to eject its contents.

Catheter Feeding.—Feeding by means of the catheter No. 15 passed into the duodenum has been a useful means, according to Hess, of supplying nourishment to persistent vomiting cases.

Medication.—I am further very much inclined to keep out of the stomach everything except food and a weak bicarbonate of soda solution. Bicarbonate of soda, 10 to 20 grains to the pint, is invariably added to either the food or the water. I do not look with favor upon the preparations of opium or the bromids, and think that little is to be expected from them. In some cases they increase the vomiting. If a sedative is to be administered by the stomach, paregoric, 5 to 10 drops, well diluted, answers best.

Later Operations.—When the vomiting continues in spite of treatment, and the child shows progressive loss in weight and strength, it is safe to assume that a considerable degree of hypertrophic stenosis exists and operation should not be delayed. Temporizing is safe only when there is no pronounced loss in weight.

* Dr. George F. Still, of London, who has had considerable experience with different operative methods, advises divulsion.

Rectal Medication.—For sedative effects six grains of bromid of sodium with one grain of chloral in one ounce of mucilage acacia may be passed into the descending colon through a No. 14 American catheter. In order to place the solution in the colon, the catheter should be introduced eight inches. The colonic medication will be useful for a day or two only, as the parts soon become intolerant, and such medication is not longer retained. I never employ this method oftener than twice in twenty-four hours.

Local Applications to the Stomach.—Local treatment is of little or no value. I have yet to see any improvement follow the use of stupes, compresses, or irritant applications.

ACUTE GASTRO-ENTERIC INTOXICATION

In the consideration of this subject we deal with a most important portion of the child's anatomy, parts that differ in their location in the body, in their anatomic structure, and in function. The gastro-intestinal tract is exposed, of necessity, to influences from without which may exert decided effects upon the physiologic processes of its different parts. It is obvious that there may be lesions in any part of its structure, and that such lesions may cause a derangement of function, if not actual disease, by transference (bacterial) to other parts of the tract. Thus there may be lesions, single or multiple, in various portions of the gastro-intestinal tract. There may be a simple gastritis, or an ileitis or colitis singly or in combination, entirely independent of pathologic conditions of the other portions of the tract. The function of the gastro-intestinal tract is the preparation of food-substances for the use of the organism. These food-substances are perishable in character and susceptible to bacterial influences and chemical change. Obviously, this long tube, adapted for absorption and of an anatomic and physiologic construction of most intricate and sensitive nature, offers ready fields for bacterial invasion and chemical change, and consequently is subjected to constant insult by toxic agents resulting from bacterial and chemical processes.

For the past two hundred years investigators have attempted a classification of the acute gastro-intestinal disorders, and while much progress has been made in framing a classification sufficient for bedside and teaching purposes, let no one imagine that the last word has been said. With an increase in knowledge of the subject, old theories and concepts will be disproved and new ones evolved which may share the fate of their predecessors. It is not wise to be carried away by the theories of our time concerning a subject the etiology of which is based upon so many factors, not the least important of which is that of physiologic chemistry, a subject of which we can boast but little absolute knowledge.

Until we possess demonstrable facts, it is best, in teaching, not to go into vague chemical and metabolic theories which no one understands.

Types.—The gastro-intestinal disorders, exclusive of the simple

digestive derangements already mentioned, may be divided clinically into two types; first, those in which there is an acute, severe, gastro-enteric intoxication without demonstrable lesions and with characteristic symptoms; second, acute ileocolitis with moderate early intoxication, characteristic symptoms, and demonstrable lesions. Clinically, and probably etiologically, there are two forms of acute gastro-enteric intoxication.

A. Cholera infantum.

B. Acute enteric intoxication.

While there are various degrees of severity of the acute gastro-enteric disorders, certain features are common to all:

(*a*) They are most prevalent during the hot months.

(*b*) Selection as to the type of child attacked. The rachitic and those suffering from various forms of malnutrition are the most susceptible subjects.

(*c*) Nearly all the patients are bottle-fed.

(*d*) The illness is rarely primary. A field has been prepared for the toxic process by mild, but perhaps persistent, digestive derangements.

Gastro-enteric Intoxication (Cholera Infantum)

This form of intoxication, while acute in character, is rarely of primary origin. It is usually preceded by disordered gastro-enteric digestion.

The onset is sudden, with pronounced prostration, persistent vomiting, retching, and the passage of large, watery stools of greenish color. The pulse is soft and rapid.

In a few hours the prostration becomes extreme, the respiration quick and shallow, the eyes sunken, and the skin dry and ashen in color. The extremities are cold; thirst is intense. The fontanel is depressed. The anus becomes relaxed, and often there is a constant slight discharge of the intestinal contents.

The temperature is variable and inconstant—it may be high, 105° F. to 106° F., or it may never arise above the normal. The low temperature cases with repeated vomiting and profuse diarrhea are the most hopeless. The system is so overwhelmed by the poisoning that a reaction is impossible.

As the disease progresses toward a fatal termination the patient develops stupor and occasionally convulsions. Coma rapidly ensues, and death from a virulent poisoning process is the outcome.

I have seen infants die in twelve hours from the onset of the symptoms. The loss of weight is most rapid. In twenty hours a nine-months-old baby lost two pounds. The loss of a pound or more in twenty-four hours is not at all unusual. At the Nursery and Child's Hospital a child fifteen months of age was taken acutely ill with vomiting and diarrhea at 11 o'clock in the morning. The child was seen by the House Physician, and suitable management was instituted. On my rounds at 4 o'clock we discovered the child moribund in spite of active treatment, and death took place six hours later. Thirty-one children

in this institution were poisoned by a can of stale milk left by a dealer who was short of a sufficient fresh supply. Thirteen deaths in children under eighteen months were traceable to this can of milk.

Not all cases are as severe as the foregoing descriptions represent. There are cases in which there is a sharp rise in temperature,—105° to 106° F.,—with active vomiting and profuse watery stools. The fever soon subsides. The stomach is washed, milk is withheld, boiled water, weak barley-water, or rice-water No. 1 (see formula, p. 104) is given, and the child is well in a few days. In the more severe cases that recover several weeks elapse before the child regains his usual vigor.

The Urine.—The urine contains albumin, and usually a few hyaline and epithelial casts—findings that are common in all severe acute toxic processes, and have no immediate or remote bearing upon the illness. While I was resident physician at the N. Y. Infant Asylum in 1890, the examination of the urine in a series of 12 cases of acute gastro-intestinal intoxication showed the presence of lactose. Recently Finkelstein has called attention to this phase of the intoxication cases.

Pathology.—The postmortem findings are negligible. The stomach and intestines present a very pale, washed-out appearance. The intestine usually contains a mucoid, yellowish substance entirely free from fecal odor. The brain may show a cerebral anemia; more often there is moderate edema of the meninges—the so-called wet-brain.

Treatment.—The management of the case depends entirely upon the nature and urgency of the symptoms. In the acute choleraic cases, with repeated vomiting, severe toxemia, retching, and profuse watery stools, stomach-washing and bowel irrigations are useless procedures. We must support the patient and aid him to bear the poison with which he has to contend. If the temperature is high and the skin dry and hot, a cool pack to the trunk, at 85° to 90° F., subsequently moistened with water at this temperature every half-hour, will often control the pyrexia. If the feet are cold, hot-water bottles should be brought into use. If the temperature is below normal and the peripheral circulation poor, as indicated by a leaden hue of the skin, a hot-water bath at 108° F. for five minutes will always be of service. The bath may be repeated at half-hour intervals. In addition, the immediate treatment calls for hypodermic stimulation and sedatives. The administration by mouth of food or stimulants should not be attempted. Tincture of strophanthus and brandy, hypodermatically, have served me well in these cases. Twenty drops of brandy with one drop of the tincture of strophanthus may be given at intervals of one, two, three, or four hours, depending upon the urgency of the case. A combination of morphin and atropin may be used in cases with persistent vomiting, with a view to controlling the attempts at vomiting which exhaust the patient, and also to diminish the continuous loss of the fluids of the body, from the repeated large, watery stools. Obviously, morphin should not be given unless this condition exists. For a child one year of age $\frac{1}{30}$ grain of morphin may be given with $\frac{1}{500}$ grain atropin, and repeated as required, not oftener than once in two hours. After the first year $\frac{1}{30}$ grain of morphin may

be given as an initial dose. Beneficial effects from the morphin will be noted in a diminution in the number of stools and the frequency of the vomiting. In milder cases of infection, in which the vomiting and defecation are less frequent, a different course is to be pursued. In these cases there should be abstinence from food, boiled water being given if the child can retain it. If vomiting persists, the water should be discontinued. The stomach should be washed at least once daily and the colon irrigated. If the irrigation brings away mucus and fecal matter, it should be repeated at intervals of from eight to twelve hours. The child should never be disturbed for this purpose if the intestine continues to empty itself at frequent intervals. A reduction in the temperature, cessation of the vomiting, and a diminution in the number, and improvement in the character, of the stools, tell us whether or not the case is doing well and determine the further treatment, after the initial dose of castor oil or calomel has been given. As a rule, the milder type of case does better when calomel is used. If there is a tendency to vomit, the oil will rarely be retained, regardless of how it is given. From $\frac{1}{15}$ to $\frac{1}{10}$ grain of calomel may be given at fifteen-minute intervals until one grain is given. While slower in its action, it is ultimately of more benefit than the oil, which is rejected. Of late I have used a solution of sulphate of soda (Glauber's salt), as advocated by Dr. L. E. La Fétra, of New York, with surprisingly good results. It is well retained, even in the vomiting cases, and when given in doses of two drams, produces a free, watery evacuation without tenesmus. I usually prescribe it as follows:

℞ Sodii sulphatis . . . . . ℥j
Elix. simplicis . . . . . ℥j
Aquæ . . . . . q. s. ad ℥iv
M. ft. solutio.
Sig.—Two teaspoonfuls every thirty minutes until four doses have been taken.

Milk Substitutes.—When the vomiting has subsided, teaspoonful doses of plain water, bicarbonate of soda solution, barley-water, granum-water, or rice-water should be given at fifteen-minute or half-hour intervals, and the amount should be increased in quantity and given less frequently as the case improves. It is well, in using milk substitutes, such as cereal waters, to use alternately, for the sake of variety, three or four different preparations. The child will not so soon tire of the milk substitute as when but one is given, and will thus take more food. It is extremely rare that the substitutes barley, rice, or granum will not be taken if used in this way, particularly if they are made more palatable by the addition of salt and sugar or saccharin.

Termination.—The termination of acute gastro-intestinal intoxication is in death, prompt recovery, or in the development of ileocolitis. The transition to an ileocolitis in some cases is so sudden that its existence from the onset is often assumed. That such is not the case is proved by a large autopsy experience in hospital and institution work, with cases dying in a day or two from toxemia, in which no intestinal lesions of consequence were found. The continuation of fever and diar-

rhea, with loose green mucous stools, means that an ileocolitis has developed as a result of the toxic agents in the intestine.

Drugs.—Unusual care must be exercised in the use of astringent drugs in the cases we are discussing. I refer particularly to cases that are mild or moderately severe. It is to be remembered that it is in the intestinal contents that the trouble exists, and not in the intestinal structure, and that the diarrhea is a conservative attempt on the part of nature to protect the intestinal structure. Our first efforts, therefore, should not be directed toward stopping the diarrhea, but toward assisting in the elimination of the intestinal contents productive of the illness. The indiscriminate use of opium and astringents may do irreparable damage in a very short time through a locking up of the intestine, which may be followed by a sudden rise in temperature, convulsions, coma, and death. Opium is a most useful drug for the treatment of diarrhea in children, but must be used with caution. When there is tenesmus, with frequent large, watery stools, opium may be given in small doses sufficient to control the number and character of the stools, with a view to prevention of an excessive loss of fluids from the body. This drug should never be given when there are only four or five free evacuations in twenty-four hours, associated with more or less fever, as in these cases this number is required to maintain proper drainage. The opium should further be given independently of other medication, so that its use may be stopped when the excessive number of stools ceases, or in the event of a rise in temperature after it has been given. It would not be desirable, perhaps, to discontinue the bismuth or other drugs which may have formed a part of the prescription. In using opium I prefer Dover's powder, ¼ to ½ grain, at intervals of two or three hours, for a child from six to eighteen months of age. Bismuth subnitrate in not less than 10-grain doses at two-hour intervals has given most satisfactory results. In order to be of service it must produce black stools. In other words, if the bismuth is not converted into the sulphid in the intestine, it apparently is of no service; if it passes through the bowel unchanged, no favorable influence will be exerted on the intestinal contents. This occurs in a small percentage of cases. In such an event the necessary amount of sulphur may be supplied by the use of precipitated sulphur, one grain being added to each dose of the bismuth. A convenient and agreeable way of giving the bismuth is the following:

℞ Bismuthi subnitratis . . . . . ℥v
Syrupi rhei aromatici . . . . . ℥iij
Aquæ . . . . . q. s. ad ℥iv
M. Sig.—One teaspoonful every two hours.

If sulphur is necessary, a one-grain powder may be added to each dose of the bismuth mixture at the time of its administration. In the same way Dover's powder, if opium is indicated, may be dropped into the bismuth mixture. The bismuth is continued in the large doses until the child is ready for milk, when the dose is diminished one-half and continued until full milk-feeding is permissible, or until constipation

demands its discontinuance. In using the bismuth in the large doses advised it is necessary that the chemically pure drug be obtained. If free nitric acid or arsenic is present, as is the case in some of the commercial bismuth on the market, vomiting may result, or symptoms of arsenical poisoning may develop. Irrigation of the colon (p. 761) may be used when there is a tendency to bowel inactivity with high temperature. If there are loose watery passages, irrigation is not called for.

Hypodermoclysis.—The injection of warm normal salt solution into the cellular structures of the body is frequently advocated by pediatric writers for the very urgent cases in which there is extreme prostration and rapid loss in weight due to the persistent watery discharges. I have employed this treatment in a great many cases and have never demonstrated that it is a measure of any great utility. In the cases where the addition of the fluid is most needed, it will not be absorbed because of the lowered vitality of the patient. Those whose tissues are able to take up the salt solution appear to do well without it.

Diet.—A difficult problem of no little importance is the nutrition of the patient after the acute symptoms have subsided. When the temperature has been normal for two or three days, and the character of the stools improves to such a degree that freer feeding than carbohydrate decoctions is to be thought of, unusual care is necessary in order to avoid a reinfection.

Skimmed Milk.—It must, of course, be our effort to resume milk-feeding as early as possible, but in resuming milk the amount given must be increased very gradually—at first only one-quarter to one-half ounce of skimmed milk being given in every second feeding of the cereal gruel. In not a few cases even these small amounts will result in a rise of temperature and a return of the diarrhea. There are always pathogenic bacteria remaining in the intestinal tract after an illness of this nature, which, under the influence of such a favorable culture-medium as milk, take on renewed activity. The whole illness may, therefore, be repeated, perhaps with greater severity than the original one, if the milk-feeding is persisted in. I have repeatedly seen in consultation infants who were having what was called a relapse. What they did have was a reinfection, with all the symptoms as severe as, or more severe than, those of the first infection, because of a lack of appreciation of the necessity of great care in resuming milk. To avoid mistakes in feeding at this time, as well as early in the disease, all directions should be carefully written. Nurses and mothers who think the physician is overcautious and pity the hungry child are very apt to forget oral instructions and give more milk than is ordered. If the small amount of milk agrees, it may gradually be increased by the addition of one-half ounce to each feeding every two or three days. Rarely, however, will it be possible or wise to attempt to give, for the remainder of the summer, as strong a food as was taken before the illness. In milk-feeding at this time superfat must not be used. Either full milk or skimmed milk, properly diluted, should be given. If there is a tendency to relaxation of the bowels, with frequent passages, I order the use of

skimmed milk. Whether the food shall be pasteurized, sterilized, or raw depends upon the conditions referred to under Pasteurization and Sterilization (p. 108).

The Wet-nurse.—Every summer I have infants under my care who, after an attack of diarrhea, cannot take even as small an amount of cow's milk as one-half ounce in each feeding. Not a few of the marasmic out-patient infants belong to this class. After a sharp intestinal infection, if the child shows inability to take a nutritious diet, a wet-nurse may be secured for the well-to-do, but the wet-nurse's milk will not always agree, as I have repeatedly found. Children who have been very ill with any of the severe forms of acute intestinal disease of summer have, as a result, a very weak fat-capacity, and the wet-nurse's milk, which perhaps contains 3 or 4 per cent. of fat, produces diarrhea sufficient to require its discontinuance. When employing the wet-nurse in such cases it is best never to permit the child to have the full allowance of breast-milk at first. To a child from three to six months of age, for example, it is wise to give two or three ounces of barley-water or a 5 per cent. milk-sugar water before each nursing, so that the patient will be satisfied with two or three ounces of the breast-milk. When cow's milk cannot be given and the nurse's milk does not agree, or where for any reason a wet-nurse is not possible, we are called upon to furnish other means of nutrition, and this, with our available resources, will not be of a very high order for infants under one year of age.

Animal Broths.—The animal broths are of very little service. They contain but little nourishment even if given in considerable quantity. They produce a decided laxative effect during convalescence from diarrhea. They are of value only in small quantities of an ounce or two added to the gruel to make it more palatable.

Cereal Decoctions.—Strong starchy foods cannot be digested in sufficient amount to maintain the nutrition. Dextrinizing processes are therefore of considerable service. The starch is thus converted into maltose, which is readily assimilable. With this, as with the broth, the relaxing effect of the food on the intestine may be felt, frequent bowel evacuations being a possible result. The dextrinized gruels, however, are always worthy of trial, and they have been of considerable service in many cases as a substitute for cow's milk.

Evaporated Milk.—When breast-milk is not available, canned condensed milk usually answers better than any other means of nutrition, being much more easy of digestion than is fresh cow's milk. The condensed milk at first is added in small quantities to the cereal water made from barley, rice, or granum, No. 1 strength being employed. (See formulary, p. 104.) One-half dram may be added to every second feeding for the first day, and on the following day this amount may be added to every feeding. The condensed milk usually will be well taken and well digested. It is gradually increased until two, three, or four drams are added to each feeding. When it seems desirable to use more than two drams at each feeding, the fresh or evaporated milk, if obtainable, furnishes an increased amount of proteid and fat without the

excessive percentage of sugar. In not a few cases the combination of condensed milk and cereal diluent must furnish the nourishment for the remainder of the heated term. With the advent of cooler weather, one ounce of weak raw milk with the cereal diluent may be substituted for one of the regular feedings, and later this may gradually be increased one-half or one ounce at a time until the raw milk comprises one-third of the food mixture. When this point is reached, an attempt may be made to replace with raw milk another feeding of the condensed milk. In this way, by carefully watching the case, a gradual replacing of the condensed milk by fresh raw milk feeding may successfully be brought about until raw milk only is given.

Feedings After the First Year.—After the first year similar methods may be followed if necessary, although at this age plain milk will usually be tolerated earlier, and other means of feeding than the milk may be brought into use. Zwieback, bread-crusts, and scraped beef—two or three teaspoonfuls a day—will often be taken without inconvenience when milk in sufficient amount for proper nutrition disagrees. At this age the gruels also may be made stronger—No. 2 or No. 3 (see formulary, p. 104) will often be well borne. An important point to be remembered in feeding convalescents from an acute gastro-enteric disorder is that the food must not be forced, and that the child must be fed only in accordance with his digestive capacity. This can best be determined by watching the temperature and the stools. The gruels as substitute foods, whether alone or combined with condensed milk, may be given in quantities equal to those which the child was accustomed to take in health, and they may be given at more frequent intervals, never, however, oftener than every two hours. A child who has been fed at four-hour intervals may take the substitute at three-hour intervals. If fed at three-hour intervals, he may receive the substitute at two or two and one-half hour intervals. When constipation follows a sharp attack of diarrhea, an enema must be used not oftener than once in twenty-four hours. The patient should not be given a laxative unless there is fever for several days after the acute symptoms have subsided.

Eiweiss Milch (Proteid Milk).—In young infants—under nine months or thereabouts—the Eiweiss Milch of Finkelstein (p. 74) may sometimes be used with good effect. The taste, however, is not agreeable to older children, many of whom refuse it. In such instances saccharin may be used for sweetening purposes. At first, after the acute symptoms have subsided, it is given with barley-water, one part of the milk to three parts of barley-water. This may be rapidly increased to one-half milk and one-half barley. It is not wise in most instances to give the milk stronger than this dilution. The Eiweiss Milch will be retained and digested more readily than cow's milk, may be given in larger daily amounts, and is a valuable means of sustaining the child for a few days or a week until cow's milk or condensed milk (p. 114) may be tolerated.

Acute Enteric Intoxication

This type of intoxication differs clinically from the foregoing in that there is no vomiting and rarely fever. Any elevation of tempera-

ture occurring is usually no more than a sharp rise to 105° or 106° F., and is of very temporary duration. In the great majority of the cases there is no such elevation, and more often during the entire course the temperature is subnormal.

The presence of moderate fever is a favorable sign, and indicates a more favorable prognosis. The clinical picture is similar to that of a case of gastro-enteric intoxication in that the prostration is extreme, the extremities are cold, the eyes sunken, the fontanel depressed, and the features drawn and pinched. Convulsions and muscular twitchings are often present. The mental condition is dulled, and the child lies in a semi-stupor, offering little or no resistance when disturbed. Diarrhea may be present, or there may be constipation, with or without tympanites. In some of these patients there is an intestinal paralysis sufficient to resist all attempts at an evacuation. I have seen such patients die in twenty-four hours from the onset without a degree of temperature and without a sign of diarrhea.

If an evacuation occurs, it is usually a green, mucous stool, which may be very offensive, although this is not always the case.

The milder forms are characterized by an elevation of the temperature and varying degrees of prostration.

Pathology.—The intestinal lesions in these cases are of no consequence. There is perhaps an area of congestion here and there in the lower ileum or colon, with enlargement of the solitary follicles and epithelial desquamation.

Treatment.—As mentioned above, there may be moderate diarrhea or marked bowel inactivity. In both conditions castor oil in doses of never less than two drams is to be given. This is followed by discontinuance of the milk, whether the patient is bottle-fed or nursed. As a substitute, barley-water, rice-water, or granum-water No. 1 (p. 104) may be given, with salt and cane-sugar or saccharin added for flavoring purposes. The treatment of these cases is facilitated by the fact that, owing to the absence of vomiting, the food is usually well taken throughout the entire illness, the patient ordinarily being very thirsty. In the event of excessive diarrhea—a rare condition—the indications for medication are the same as those given under Acute Gastro-enteric Intoxication (p. 198). Castor oil or sulphate of soda (p. 201) is to be used instead of calomel at the beginning of the illness.

Intestinal infection with defective bowel action (*paralytic ileus*) often gives us our most difficult cases and requires different treatment. In this type poisons generated in the intestinal contents or elsewhere seem to be of such a nature as to cause a partial paralysis of the small intestine, so that often, only with the greatest difficulty, can an evacuation be induced. So difficult is this, in fact, that the possibility of an acute peritonitis or an intussusception may occur to the physician. It is very necessary to maintain bowel action and to prevent the accumulation of gas, which, by distending the intestine, increases the tendency to constipation. Several cases of this nature, with high temperature, sluggish bowel action, and intense prostration, are seen by me every year.

Illustrative Cases.—A case in point is that of a female infant nine months of age who had been most difficult to feed. In July she developed a sudden high fever of 105° F. and convulsions, which were followed by muscle twitchings, head-rolling, and marked prostration. The temperature was uninfluenced by local means, although there was no diarrhea or vomiting. The attending physician, anticipating intestinal infection, gave calomel in divided doses with frequent bowel irrigation. Foul-smelling fecal material came away with the irrigation, but the temperature and the nervous symptoms persisted; in fact, the condition became worse. I first saw the child when she had been ill ten or twelve hours, and directed that one-half ounce of castor oil and a high irrigation of normal salt solution at 80° F. be given. As a result of the treatment there was one small green movement in addition to what came away with the irrigation, which was considerable. The patient was somewhat relieved and the nervous symptoms measurably subsided, though the temperature still ranged between 104° and 105° F. As a result of the calomel, 1½ grains of which had been given, and the ounce of oil, a free diarrhea was expected. It did not, however, occur. I then directed that one-half ounce of castor oil be given daily in addition to the irrigation severy eight hours. This was followed by a slight improvement in the symptoms, but five days of the treatment were required, one-half ounce of oil and one grain of calomel being given daily, with abdominal massage, before the resulting peristalsis was sufficient to relieve the intestine of its contents. After the establishment of free bowel action the child recovered.

A similar case which resulted fatally was seen in consultation. In this patient, a girl eight years old, the toxemia was intense. There appeared to be almost complete paralysis of the small intestine. Only small, very foul evacuations could be induced, in spite of the most active local and internal measures. The child died from toxemia before free bowel action could be established.

The management of these cases of the inactive type is partially illustrated in the histories above given. Our efforts are to be directed toward supporting the patient by the use of stimulation, given hypodermically or by the stomach, and by the use of a milk-free diet, powerful laxatives, and frequent colon flushings. Castor oil may be required repeatedly, and should be given freely in doses of at least one-half ounce every twelve hours, until four or five passages in twenty-four hours result. Sulphate of soda (p. 201) is given with satisfactory results in cases of this type. While the fever, prostration, and bowel inactivity persist, it is necessary to continue the irrigations. In a few cases apparently better results were secured by using for the irrigations cold water (70° to 80° F.), with the addition of Epsom salts, one ounce to the pint.

Stimulants.—Because of the tendency to convulsions and nervous irritability, strychnin should not be given. The tincture of strophanthus answers better than any other heart stimulant. Alcohol should be used only under the most urgent conditions of prostration. Atropin sulphate, from $\frac{1}{100}$ to $\frac{1}{400}$ grain given hypodermically, is probably our most valuable means of stimulation. It may be repeated at four- to six-hour intervals. A combination of tincture of strophanthus and brandy, or digitalin and brandy, given hypodermically is of value. For a child six months of age 20 minims of brandy with 1 drop of tincture of strophanthus, or 20 minims of brandy with $\frac{1}{300}$ grain digitalin, may be given and repeated every two hours if necessary, according to the requirements of the case. After the first year children may be given as much as $\frac{1}{100}$ grain of digitalin or 2 drops of the tincture of strophanthus.

Irrigation of the colon (p. 761) is a measure of inestimable value,

both for its immediate local effect and also for increasing general peristalsis and thus emptying the small intestine. An increase of the peristalsis is sometimes well secured by the following procedure: After the colon is washed with a normal salt solution at a temperature of 95° F., the tube is introduced as far as possible and 8 ounces of water at 60° F. is allowed to escape. The tube is immediately removed and an attempt is made, by elevating the buttocks and pressing them together, to have the child retain the solution for a few moments.

In using nutrient enemata and in colon flushing for purposes of supplying fluids to the circulation we have found that the solution is best retained when introduced warm—at a temperature of about 100° F. The cooler the solution, the more quickly is it expelled through exciting peristalsis. This fact may be taken advantage of in these cases of bowel inactivity. After an enema of cool water peristalsis of the small intestine will often result in the passage of a considerable quantity of its contents into the colon, to be expelled later with the water. This I have frequently demonstrated. The action of the cool water will be further assisted by light abdominal massage maintained after the tube is removed. Recovery may follow the clearing-out of the intestine, or an ileocolitis may result, as in gastro-enteric intoxication. The process of transition may require but a surprisingly short time, and if recovery is not prompt, an ileocolitis will almost certainly be the outcome.

Upon resuming the milk diet the precautions relating to the use of cow's milk, referred to under Acute Gastro-enteric Intoxication (p. 198), must be observed.

ACUTE INTESTINAL INDIGESTION

This disorder is referred to first because, according to my observation, of all the intestinal disorders, it is the most frequently seen. Because its importance is not recognized, the prophylaxis and treatment receive but little consideration. The proper appreciation and management of a disordered intestinal function are essential to the solution of that most important problem—summer mortality from diarrheal diseases. As pointed out elsewhere, the most fertile field for later disease is furnished by the intestine which is persistently deranged.

In June the mortality from acute intestinal disease in Greater New York in children under two years of age is usually but 300 to 500 less than in August. The high June mortality has been explained by the fact that the list includes many cases of malnutrition and marasmus, but it must be remembered that the list includes also cases with diminished intestinal resistance, which are ready victims to the almost invariable exposure, through infected food, to which every bottle-fed infant is subjected at some time during the summer, when heat and humidity aid in lowering the general vitality. A close investigation of hundreds of cases of severe acute intestinal disorders of infants has shown that a great majority are not so acute as a superficial history would indicate. A complete history in a case of acute gastro-enteric intoxica-

tion (cholera infantum), or in one of apparently severe intestinal infection with resulting colitis, or one of acute colitis (dysentery), will show that the child had defective intestinal digestion during the previous cold months, and that the grave condition which he presented when brought for treatment had been preceded for two or three or more days by simple diarrhea, probably without vomiting and with little fever. The fact that the patient did have green passages and did have diarrhea proves the existence of intestinal indigestion before the urgent symptoms of fever and prostration developed. In about 1 per cent. of the cases of severe gastro-enteric diseases of children in summer the onset is sudden, without warning, and with urgent symptoms.

Symptoms.—Temperature is usually present in varying degree. It may be as high as 104° to 105° F. There are restlessness, abdominal pain, and moderate prostration. The stools are frequent, undigested, green, and may contain mucus.

Duration.—Properly managed, the case has but a few days' duration. The temperature readily subsides, and the child soon shows evidence of displeasure at the reduced diet.

Prognosis.—The condition is serious only in the sense that it may be the starting-point of severe intestinal intoxication. Properly treated cases present few dangers.

Treatment.—The time to treat these cases of intestinal indigestion, in order to secure most effective prevention of severe toxemia and grave lesions, is before the physician sees the patient. The reduction in the mortality rests in the education of the mother to the point of realizing that a loose green stool is a danger-signal. When it occurs, she is to give a dose of castor oil (two teaspoonfuls), stop the bottle or stop the nursing, and give the baby boiled water or barley-water until the physician can see the patient. Any physician who has children under his care, whether in hospital, institution, out-patient, or private practice, and who does not so instruct the nurse or mother, fails in his obligation as a practitioner of medicine.

In the Breast-fed.—Intestinal disease of severity in infants fed entirely on breast-milk is exceedingly rare. With a breast-fed baby it may be necessary to discontinue nursing for from twelve to thirty-six hours. The child is given one or two drams of castor oil, and barley-water or rice-water No. 1 (see p. 104), to each pint of which ½ or ¼ ounce of cane-sugar is added. While nursing is discontinued the breasts should be pumped at the regular nursing hour so as to keep up the flow of milk and relieve the pressure. Rarely will other treatment be required.

The Bottle-fed.—With the bottle-fed greater caution will be necessary. The management consists in continuing the carbohydrate diet, which the well-trained mother has instituted, until the stools approximate the normal. This may necessitate an abstinence from milk for three or four days, by which time it may usually be resumed. The milk should always be given in reduced quantities for the succeeding day. One-half ounce of skimmed milk may be added to every second feeding or to every feeding of the gruel. If it is well digested and causes no return of the

diarrhea, the amount of milk may be increased tentatively every day or two by the addition of one-half ounce to each feeding.

In some of these cases the diarrhea without fever will continue. In such instances the administration of 10 grains of bismuth subnitrate (Squibb's), with ¼ to ½ grain of Dover's powder at two- to three-hour intervals, aids materially in establishing the normal intestinal function.

PERSISTENT INTESTINAL INDIGESTION

The greater part of this subject has been covered in the consideration of the management of malnutrition and marasmus. It is again referred to here in order to call attention to those conditions which, though mild in character, constitute so important an etiologic factor in the acute intestinal diseases of summer. There is perhaps not enough bowel disturbance to interfere with the nutrition, but we have learned that a considerable part of the summer mortality of acute intestinal diseases occurs in children who have a reduced intestinal resistance as a result of persistent intestinal indigestion.

A considerable number of infants do not have normal bowel evacuations even for two days out of ten. There is constipation, which is neglected, or there is passage of undigested or loose stools. In some cases constipation alternates with diarrhea. Occasionally there is a sharp attack of diarrhea with fever. In getting the history of our cases, regardless of the nature of the illness, we often learn that the infants have undigested stools. There is a tendency to an unstable intestinal equilibrium. This condition of intestinal indigestion is almost without exception due to errors in diet involving the habitual giving of unsuitable articles of food, or of food too strong, or feeding at too short intervals.

Treatment.—The management of each case is determined by the age of the patient and the conditions of the family, and is discussed in the sections relating to Nutrition, Substitute Feeding, and Modification and Adaptation of Foods.

PERSISTENT INTESTINAL INDIGESTION IN OLDER CHILDREN

In these cases there is a disturbance of function and there may be sufficient absorption of toxins of an unknown nature from the intestinal canal to produce a wide range of symptoms. Whether this causes pathologic conditions in other organs it is not possible to state. It is assumed, however, that such is the result. Comparatively little attention appears to have been given the subject. There is no doubt whatever that it is a factor of great importance in the nutritional and so-called functional nervous disorders of childhood. One reason why little attention has been called to the intestinal tract as an etiologic factor is perhaps because the child is not necessarily constipated. Intestinal toxemia may exist with one or two apparently normal passages daily, and even without the presence of indican in the urine.

Pain is not a necessary symptom. It is occasionally present, however, as is also abdominal discomfort involving a sensation of constriction and pressure.

In my cases the conditions in which intestinal toxemia has seemed to play a part sufficient to form a symptom-complex have been habitual headache, disorders of speech, choreic in character, secondary anemia, habitual sleep-talking, sleep-walking, and general irritability without apparent cause. Well children are naturally bright and happy. When a child is persistently cross and irritable, he is not a well child. Chronic papular eczema has proved to be of intestinal origin in a considerable number of my cases, particularly among the out-patient class. The condition often regarded and treated as malaria is not infrequently due to intestinal toxemia. Fever of a degree or two may be present for protracted periods. Nearly every case which has come under my care had been given at some time or other a course of quinin. Such a patient is very apt to be habitually tired and languid. He may be fairly bright early in the day, but in the afternoon he yawns and complains of being tired and sleepy. The blood examination fails to reveal signs of malarial infection, and quinin in full doses furnishes no relief. The appetite may be satisfactory, the tongue may show no signs of digestive disorder, although such is rarely the case. The tongue is usually coated and the appetite capricious. The symptom-complex which suggests to the mother the thought of worms is usually the manifestation of intestinal toxemia.

Illustrative Cases.—An interesting case of this nature came under my care a few years ago. The boy, aged three years, highly nervous and irritable, was afflicted with day terrors—*pavor diurnus*. The attention of the nurse was attracted to the condition by the boy, who asked that the "bugs" be removed from his lap-robe when he was in his go-cart. The time was mid-winter, and there were no bugs present. I fortunately saw the boy on one of these occasions and asked him to pick up a bug, which he tried to do with his fingers. He could not understand why he could not catch them. In this child the tongue was heavily coated and there was moderate constipation, a laxative being required every third day. There was an excess of indican in the urine. The boy was taking a large amount of rich cow's milk daily. After stopping this, a full dose of rhubarb and soda was given daily and he was well in a week.

A boy five years old was brought to me because of disturbance of speech. He was normal until three and one-half years of age, when he had difficulty in the formation of entire words. This had increased with the development of other nervous phenomena. There was marked incoördination in speech—*dysarthria*—due to choreic movements evidently of the tongue and laryngeal muscles. The boy was exceptionally well nourished and there was an absence of choreic movements in other parts of the body. The knee reflexes were considerably increased. He was easily excited. Hard play was followed by restless nights, and he talked in his sleep every night, regardless of the habits of the day. Inquiry into the diet failed to reveal any grave errors. He drank one quart of milk daily, although milk had never agreed with him as an infant. The bowels moved once daily. The movements were often of foul odor, and the mother stated that she was satisfied they were too small. The case after three weeks showed striking improvement on a diet without milk, with a daily laxative, and made a complete recovery in three months.

A third patient was a girl six years of age who lived in the best surroundings, in a country district. She was pale, rather thin, and below weight for her age. She had been chronically tired and irritable for two years. The blood showed the existence of a secondary anemia, and the urine contained a marked excess of indican. She had been taking quantities of quinin. There was no constipation. Her appetite was indifferent. She favored milk and was paid for drinking extra quantities of it, about two quarts daily being taken. Marked improvement followed the withdrawal of milk from the diet and the use of laxatives, after which she passed from my observation.

In many cases of this nature there is a milk intolerance, perhaps both for the fat and protein.

Treatment.—In my experience the management of these cases, which has been most successful, has consisted in the discontinuance of cow's milk, with the further dietetic restriction to but one egg every second day, and meat but once daily. Cereals, fruit, and vegetables are taken as suggested in the dietary (p. 96). The use of green vegetables is particularly encouraged. In place of cow's milk, malted milk is given, and to facilitate the bowel action a raw apple is given in the middle of the afternoon. The patient takes an after-dinner rest for an hour or two. If constipation is obstinate, rhubarb and soda of the following strength are used:

℞ Pulveris rhei . . . . . gr. iv
Sodii bicarbonatis . . . . . gr. viij
Syrupi rhei aromatici . . . . . ℥ss
Aquæ . . . . . q. s. ad ℥j
M. Sig.—One teaspoonful once or twice daily

If the patient can take a capsule, I prefer the following for a child from five to eight years of age:

℞ Tincturæ belladonnæ . . . . . gtt. ij
Tincturæ nucis vomicæ . . . . . gtt. iv
Extracti cascaræ sagradæ . . . . . gr. j–iij
Sodii bicarbonatis . . . . . gr. iij
M. ft. capsula no. i.
Sig.—To be taken at bedtime.

The medication may be continued for three or four weeks, after which time one dram of the syrup of the hypophosphites (Gardner's) may be given three times a day. This may be alternated with:

℞ Ferri et ammonii citratis . . . . . gr. xxiv
Elix. simplicis . . . . . ℥j
Aquæ . . . . . q. s. ad ℥iv
M. Sig.—One teaspoonful three times daily after meals.

In the event of constipation persisting after the use of the laxative, the oil treatment (p. 242) may be brought into use and continued until the condition is relieved.

COLIC

Few children complete their first year without having severe attacks of intestinal colic. In some cases the child thrives in spite of the attacks, in others such a grave degree of indigestion exists that the condition may prove most serious. The character of both human and cow's milk, its ready decomposition in the intestine, with the formation of gas, together with the lack of development of the infant's digestive apparatus, explain in no small degree the frequency of colic in the young. When cow's milk is used as in the bottle-fed, we are dealing with a substance foreign to the infant's digestive apparatus, and often colic is the outcome. Any condition that will give rise to indigestion may, of

course, be a cause of colic. Children who take too much milk, too strong milk, or who take milk too frequently are the usual subjects of colic. Probably the most frequent cause of colic is indigestion of the proteid of the milk. Either the proteid is in excess or the child has poor proteid capacity. Not a few cases of colic are due secondarily to defective bowel action. A passage occurs each day, but in too small amount. There is a continual fecal residue in the intestine which undergoes decomposition with gas-formation. Cold feet are often associated with colic. Fright, anger, fatigue, excitement—any condition, in short, which may make a sufficiently unfavorable impression upon the child's nervous organism—may produce indigestion and colic.

Likewise any adverse nervous mental state in the mother may produce colic in the breast baby. Constipation in the mother is not an infrequent cause.

Infants who have colic habitually will more often have it late in the day than at any other time.

Diagnosis.—While the diagnosis is usually a simple matter it must be remembered that intussusception (p. 231) and appendicitis (p. 251) may cause symptoms identical with colic.

Treatment.—Repeatedly I have had under my care nursing babies who suffered from habitual colic and who recovered after the regulation of the mother's bowels by exercise, diet, and medication. In breast-fed cases in which the mother's milk upon repeated examination proves too strong and the child suffers daily from colic, a dilution of the milk may be made by the use of plain water or barley-water, from one-half ounce to one and one-half ounces of the diluent being given before each nursing. In addition the bowels of the colicky infant should be made to move at least twice daily, morning and evening. When this does not take place readily a simple laxative, such as milk of magnesia, one-half to one teaspoonful, or 10 to 30 drops of aromatic cascara sagrada, may be given daily. Under no condition should a child subject to colic be allowed to go without a bowel evacuation for more than twenty-four hours.

Diet.—The dietetic management of colic in the bottle-fed consists in adapting the food to the child's digestive capacity. The bottle baby may have habitual colic moderately and thrive, but is receiving an imperfectly adapted food. Here, as in the breast-fed, the condition is usually dependent upon an excessive casein supply or a diminished casein capacity. The matter of the adjustment of cow's-milk proteid in indigestion is discussed in detail under Milk Adaptation (p. 70). It is sufficient to say that the colicky bottle baby should have long intervals between feedings—usually one-half hour longer than otherwise allowed. Digestion is slow in many of these cases, although in other respects they may be healthy children. In some the indigestion and pain are so severe that a perfect adaptation of cow's milk is impossible, and some other food than cow's milk will be required. The prevention of colic, then, it will be seen, rests upon a proper adjustment of the food.

Enemas.—The immediate attack is usually best relieved by the use

of an enema at 110° F. of a normal salt solution or of soapsuds, which, by inducing a movement of the bowels, allows the gas to escape.

Medication.—A soda-mint tablet dissolved in one ounce of hot water given in one-teaspoonful doses repeated at five-minute intervals is sometimes efficacious. For a child under one year of age 3 drops of spiritus ætheris compositus (Hoffmann's anodyne) may be given in 2 teaspoonfuls of hot water and repeated at ten-minute intervals. From 5 to 10 drops of gin, when given in 3 teaspoonfuls of hot water, may be used, and repeated in from ten to fifteen minutes if the attack continues.

Hot Applications.—Hot applications to the abdomen are often grateful to the patient. For this purpose 10 drops of turpentine in one quart of water at 120° F. may be used with benefit. A flannel is wrung out of the water or the solution and applied over the abdomen and covered with a dry piece of flannel. The dressing may be changed every ten or fifteen minutes.

Opium and its derivatives should not be used in the treatment of colic. This drug may relieve the pain temporarily, but it aggravates the conditon to which the colic is due.

PREVENTION OF THE ACUTE INTESTINAL DISEASES OF THE SUMMER

Preventive medicine, so called, is at the present time engaging the attention of the best medical minds. The acute intestinal diseases of summer, with their large infant mortality, offer a better field for life-saving measures than does any other department of pediatrics.

Potent etiologic factors in summer diarrhea are unfavorable climate and unfavorable environment. In the class which furnishes the largest mortality, climate cannot be changed for a sufficient number to exert any great influence on the general mortality. Through education the environment may be radically improved, but it cannot be changed. The hot months come and the tenement child must remain at home. Excursions and outings of various kinds are valuable in a small way to comparatively few, as the child must return to the tenement home at night or after a few days' absence, so that in our consideration of this class of patients in large cities we must accept unfavorable environment and hot weather—in other words, we must treat these cases in their homes. Those more fortunately situated, who can have the advantage of the country and intelligent care, are proportionately less liable to diarrheal diseases. Other than climate and environment, the determining etiologic factors among all classes are: first, a disordered gastro-enteric tract; second, infected food; third, faulty feeding methods; fourth, an absence of appreciation on the part of the parents and physicians of the fact that an attack of diarrhea or vomiting, or even a green, undigested stool, occurring in an infant under eighteen months of age during hot weather, is to be looked upon as a serious matter requiring prompt attention.

Children as well as adults are frequently exposed to disease from sources of which they are ignorant, because their power of resistance

is insufficient for their protection. With milk, the most readily infected of all nutritional substances, as the chief article of diet, it may safely be assumed that few infants will pass through the heated term without being subjected repeatedly to infection from bacteria sufficient to produce grave illness. An infant's best safeguard against intestinal infection is a strongly resistant gut, which is best secured by the absence of digestive disturbances at all seasons of the year. Feeding and intelligent management generally throughout the year has, consequently, a decided bearing upon summer mortality from intestinal diseases.

Twenty-five years ago, at the commencement of my junior service on the house staff at the Country Branch of the New York Infant Asylum, I gained my first knowledge of summer diarrhea. While making rounds early one morning in June, the matter of summer mortality among the infant population was being discussed by the resident physician, the late Dr. Clarence E. Kimball. I asked why there was such a large summer mortality in an institution situated, as this was, at a considerable elevation, in the open country, constructed on the cottage and dormitory plan, with the additional advantage of good milk, favorable environment, good nursing, and competent medical attendance. His reply was: "Take your pencil and write as we go through the wards the names of the children I indicate." I did so, and, at the completion of the round he directed me to keep the list of 30 names, saying that these children probably would not survive the summer. Seeking an explanation, I remarked that they were not delicate or athreptic. "No," he replied, "they look well, but they have foolish, ignorant mothers and susceptible intestines. They have had frequent attacks of diarrhea and indigestion during the winter and spring. The mothers steal food from their own table and give it to the children when the orderlies and nurses are out of the wards. These children have but little intestinal resistance, and will give us our first fatal diarrheal cases when the hot weather comes." I kept my list and found that the accuracy of his prediction was startling. But four of the children named survived the summer.

Since that time I have had abundant opportunity to observe that the children who have had frequent attacks of intestinal indigestion during the colder months furnish our severe cases during the summer. A most important feature, then, in prophylaxis is to teach the mother how to feed and care for the child all the year round, in order that, by keeping well, the child may maintain a high grade of intestinal resistance.

Etiology.—The principal immediate etiologic factor in the disease under consideration is an infection of the gastro-enteric contents by bacteria. The infecting elements are usually introduced by means of contaminated food and unclean feeding apparatus.

New York City Conditions and How to Correct Them.—For the well-to-do, we have high-priced dairies whose product sells from fifteen

to twenty-five cents a quart. For others, we have what is known as "certified milk," produced under the supervision of a committee of medical men, which retails at twelve cents a quart. Obviously, the majority of our infant population is not fed on these milks. The Straus Laboratories, which supply safe sterilized milk in New York city, are able to furnish it to but a small proportion of the tenement population. The other milk, the so-called "market milk," supplies nutrition for an immense majority of the infants of the poorer classes. This milk has been greatly improved of late through the efforts of the medical profession and the New York Health Department; but the matter of the regulation of milk production and sale is a large one, and the powers of the authorities are limited. The majority of our infant population, then, is fed on milk which, for them, is not a safe food; and it is among these infants that the large mortality occurs, and will continue in spite of seashore visits, daily excursions, and the efforts of the summer corps of Health Department physicians. It will continue until every large municipality, such as New York city, shall establish milk depots and ice stations where safe milk, and ice to keep it safe, may be obtained at a nominal cost, or free, if the parents are not able to pay. A visiting physician for these people is not absolutely necessary, nor is a visiting trained nurse—both are expensive luxuries; but what is necessary is the appointment, for a given district, of women with just plain common sense to teach the uninformed mothers, who are doing their best according to the light they have, the simple details of the infant's care, easily carried out when they know how, but now not enforced because of ignorance.

Dispensary Rules of Universal Application.—At the out-patient department of the Babies' Hospital and the New York Polyclinic, I have had abundant opportunity to come into close contact with a great many tenement mothers and tenement children. At these institutions we have a clientèle fairly regular in attendance, year after year; for as one baby after another appears in the family, each is brought to us for treatment. At these dispensaries there is a surprisingly low summer diarrhea mortality, because we teach the mothers how to feed and care for their children all the year round. They are taught the value of fresh air, the use of boiled water as a beverage, and the benefits of frequent spongings on hot days. Both private and dispensary mothers whose children are under my care are given pamphlets of instruction and also oral teaching bearing on these points, and particularly relating to the care of the feeding bottle and the milk. In case special articles of diet are to be given, the mothers are taught how to prepare them. Written directions are always given covering the point; nothing is left to the memory. Each mother and nurse has it impressed upon her that she must wash her hands in soap and water before touching the baby's food or feeding apparatus for any purpose, and that there must be a covered vessel in which the soiled napkins are to be kept until washed. At the first sign of intestinal derangement, regardless of the season of the year, they are taught to stop the milk at once, to give

instead a cereal water, such as barley-water or rice-water, and a dose of castor oil. It is impressed upon them that, in winter as well as summer, a green, watery stool means that the baby is ill and needs treatment. When the mother learns the above lesson for December, January, and March, she will not forget it in July. Furthermore, as a result of the immediate correction of a child's digestive disorder during the winter months, the digestive tract affords a much less fertile field for pathogenic bacteria during the summer.

Prompt Treatment Essential.—Comparatively few cases of intestinal diseases have pronounced toxic symptoms at the outset. At first there are evidences of a mild infection only. There may be vomiting, several green, watery stools, and a slight elevation of temperature, or the symptoms may be still more mild—only one or two loose green defecations. Prompt treatment at this time, even in a crowded tenement, usually means prompt recovery. When treatment is delayed and the administration of milk is continued, severe toxic symptoms and intestinal lesions are almost invariably the result.

New York City Experiments.—An interesting demonstration of what may be accomplished by proper care was made under the direction of Dr. William H. Park, of the New York Health Department, during the summer of 1902. Fifty tenement children, ranging from three to nine months of age, were selected for the experiment. These children were all fed on the Straus milk. They were visited two or three times a week by physicians especially assigned to them. The mothers were carefully instructed as to the care of the milk and the feeding apparatus, and in other necessary details. With the first signs of illness, the milk was to be stopped, the physician notified, and suitable treatment instituted. Among these 50 tenement children, all under one year of age, all bottle-fed, selected at random, there was not one death during the summer. This valuable observation bears out my contention that the deaths from summer diarrhea among tenement children may be greatly reduced by the use of good milk given under proper supervision, supplemented by prompt and competent medical care at the first sign of illness. Perhaps in 1 per cent. of the cases of summer diarrhea a very severe direct infection is evident, and the condition of the patient is very grave from the onset. In the remainder the invasion is gradual; and, if the warnings are heeded, the illness will usually terminate quickly in recovery.

How to Secure Good Milk.—To those of my patients of the better class who go to the country for the summer, and who have cows of their own in order to control their milk-supply, I give the following directions: Before milking, the udders and belly of the cow should be wiped with a damp cloth to remove clinging particles of dirt. It is in these droppings containing manure that the most dangerous forms of bacteria of decomposition enter the milk. The milker should wash his hands before milking. The first few jets of milk, coming from the ducts near the openings, are apt to be swarming with bacteria, and are therefore discarded. Immediately after the milking the milk should

be strained through several thicknesses of cheese-cloth, or through absorbent cotton, into an ordinary milk bottle, which is at once placed in a pail of cracked ice. Such simple care as this, even on an ordinary farm, gives a very low bacteria count. As may readily be seen, it is attended with very little trouble and expense. Different dairies throughout the country, which are located near my patients for the summer, meet the above requirements, for which they receive an extra compensation of five or six cents a quart.

The Necessity for Education.—The suggestions we have offered are all included under the one general heading of Education. The mother must be educated how to live, how to care for the baby, how to clothe and bathe him during the summer. It must be impressed upon her that he needs all the fresh air available. She must be educated to the point of knowing what to do at the first sign of threatened disease. Municipalities must be educated to appreciate their responsibility as factors, negative or positive, in the summer mortality. The farmer must be educated to produce safe milk, and the consumer must be educated to appreciate its value and pay for it. Above all others, the physician must be educated along these lines so as to be able to teach the mothers how to do right in the care of their children all the year round.

VOMITING

While vomiting does not constitute a disease in itself, it is a condition of such frequency in children, and occurs in such widely varying circumstances, that any work relating to diseases of children would be incomplete without its consideration.

The most frequent causes of vomiting depend solely upon the functions of the stomach. When the stomach is overfilled, vomiting may result. When substances sufficiently irritating come in contact with its lining mucous membrane, whether they are swallowed as such or are produced by fermentation or some other change in the stomach contents, they are ejected. When there is an inflammatory involvement of the mucous membrane of the stomach, either acute or chronic in character, the organ becomes intolerant of the blandest of fluids. Another condition involving the structure of the stomach, but only occasionally seen in children, is ulceration, which is usually multiple. Vomiting is the prominent, in fact the only, symptom.

Dilatation of the Stomach.—In this condition the food does not pass readily into the intestine, but remains in the stomach and undergoes changes which produce sufficient irritation to cause vomiting.

Pyloric Stenosis.—In pyloric stenosis the food is prevented by the narrow pyloric opening from passing into the intestine; one feeding follows another, the stomach becomes overloaded, and, by reason of fermentative change in the residue, sufficient irritation is produced, in connection with the spasmodic contractions of the stomach peculiar to the condition, to induce vomiting.

Causes Remote from the Stomach.—In intestinal obstruction, whether due to intussusception, volvulus, peritonitis, or impacted

feces, vomiting is an invariable accompaniment, continuing at irregular intervals until the obstruction is relieved or until the child dies.

The exanthemata and lobar pneumonia are very commonly ushered in by vomiting if the onset is sudden and intense. In appendicitis in children, vomiting is usually one of the early symptoms; so also, in the different forms of meningitis, vomiting is often an early symptom, and may continue persistently during the first few days of the illness. In nephritis, with uremia, vomiting is usually present. Vomiting may be caused by fright, by shock, or by a strain of any nature, as in whooping-cough, or it may be of purely nervous origin.

Illustrative Case.—A few years ago I had a most unusual and interesting case. The patient was a girl four years old, pale and thin. The history was that of vomiting for more than a year, which had begun with rather a protracted, badly managed attack of indigestion. At first there were but one or two attacks a day. Later they became more frequent, and for a few weeks before the child came to me the vomiting had occurred at the table with nearly every meal, before the meal was completed. The mother was most anxious and apprehensive regarding the child's condition. The former was always with the patient, always fed her, and always worried constantly throughout the meal, fearing an attack of vomiting. Using the most thorough means of examination of the stomach, I failed to find anything wrong with it. After some days' observation it occurred to me that the presence of the apprehensive mother, in whose mind the condition of the child and the vomiting were uppermost, might be a factor in causing the vomiting. I accordingly directed that the child take her meals in the kitchen with the maid, and that the matter of vomiting should not be mentioned. The mother was directed not to come in contact with the child in any way during the meal. I was much gratified and not a little surprised when the vomiting promptly ceased. After a few months of this régime the maid was taken ill, and the mother for one day attended to the feeding. Again the child vomited as before.

The management of the different types of vomiting will be referred to in the consideration of the various diseases with which it is associated.

ACUTE ILEOCOLITIS (DYSENTERY)

In dysentery there is a well-defined infection of the intestine. In common with other intestinal disorders it occurs most frequently during the hot months. The later summer and early autumn supply the most cases. In like manner it often follows the milder gastro-intestinal derangements which are productive of reduced vitality and diminished intestinal resistance.

Bacteriology.—In a large percentage of cases of infantile diarrhea associated with blood and mucus in the stools the dysentery bacillus is present. It may be found in large numbers, sometimes in almost pure cultures. Duval and Bassett, in 1902, were the first to find Bacillus dysenteriæ in the stools of cases of infantile summer diarrhea. The type of the bacillus which does not ferment mannite (the Shiga type) is not found so often in these cases as are the two mannite-fermenting types: the Flexner-Manilla and the Hess-Russell, of which the former ferments maltose, saccharose, and dextrin, and the latter does not.

The presence of agglutinins in the blood of the patient is evidence of the causal relationship of Bacillus dysenteriæ to the existing disease.

The agglutinins are not present, as a rule, until the second week of the disease.

Pathology.—The lower portion of the ileum—rarely more than three feet—and the colon are the locations of the lesion which may show a wide variation in intensity, depending on the character of the infecting organism and the resistance of the patient. While the major lesions are usually in the colon, the small intestine will show pathologic changes in at least 35 per cent. of the cases. There may be localized areas of congestion through the intestine, enlargement of the solitary follicles, and swelling of Peyer's patches. In nearly all cases, whether the lesions are mild or severe, there will be moderate swelling and congestion of the mesenteric glands.

The inflammation may be acute or chronic, and catarrhal, ulcerative, or pseudomembranous in type. Although the term, dysentery is properly used to denote only infections by the bacilli of Shiga and Flexner and the special protozoön, Amœba coli, the lesions produced may all be conveniently considered under the term, ileocolitis.

In a series of 82 autopsies upon cases of ileocolitis Holt found follicular ulceration predominant in 36, catarrhal inflammation in 26, membranous inflammation in 14, and catarrhal inflammation with superficial ulceration in 6. Of 412 cases studied by Holt and Flexner in 1903, 270 showed the presence of Bacillus dysenteriæ, the Flexner acid-forming type of organism appearing most frequently. Strains intermediate between the Shiga and Flexner bacilli are occasionally found, and in the causation of a certain proportion of cases of epidemic dysentery Bacillus pyocyaneus has been shown to be active. Amebic dysentery is common only in tropical or subtropical regions.

In *simple ileocolitis of the mild catarrhal form* the submucosa is but slightly involved. The mucosa, however, is swollen, congested, and covered with secretion, and dotted with occasional points of hemorrhage and spots of epithelial exfoliation. The lymph-follicles are swollen and hypertrophied, and the adjacent connective tissue is infiltrated with round-cells. Microscopically, this infiltration is also apparent about the vessels in the submucosa. The stools are ordinarily green and thin in consistence, and contain mucus, desquamated epithelium, and traces of blood. In *severe cases* the inflammation acquires the ulcerative or membranous character, the lymphoid follicles are elevated and superficially necrotic, and the submucosa is infiltrated with pus. In such instances the ulcerations extend deeply, and exceptionally involve the entire intestinal wall.

The Ulcerative Form.—In ulcerative ileocolitis the ulcers may originate in the solitary follicles, and are then small, superficial, round, yellow, sharply defined, and surrounded by an inflammatory zone. Later the ulcers may grow larger, coalesce, and become deeper, exposing the submucosa or even the muscularis. Ulcers may also originate in the mucosa itself and not in the follicles; this may occur in dysentery or in cases of severe catarrhal inflammation. As a consequence of the coalescence of these ulcers the mucosa has a ragged appearance,

with islands of gray or congested mucous membrane visible between the irregularly shaped ulcers of all sizes. Small ulcers heal completely, but large ones rarely do. Stenoses as the result of cicatrization of these ulcers do not occur in children. In cases of long standing all the intestinal coats are thickened, due to inflammatory infiltration, and the mucosa becomes pigmented.

In *pseudomembranous ileocolitis* the intestinal mucosa is covered with a fibrinous exudate, which can be rubbed off at first, but later is very adherent. The mucosa becomes necrotic, and larger or smaller areas are lost, leaving a congested, edematous base, surrounded by necrotic tissue. The pseudomembrane becomes colored yellow or greenish by the feces. The wall as a whole is thickened. The lesion is usually most marked in the colon, but the lower ileum is often involved as well. Healing may occur, but is rare; death is the rule.

Associated Lesions.—In severe cases of ileocolitis the mesenteric lymph-glands are involved and the spleen may be enlarged. Perforation of the bowel, abscess of the liver, nephritis, and bronchopneumonia are occasional complications.

Symptoms.—A great deal of confusion has been occasioned by attempts at a nomenclature of the acute inflammatory diseases of the intestine which shall make the clinical aspect of the cases fit the pathologic findings. Differentiation, antemortem, into catarrhal, follicular, and ulcerative types is impossible, as has been proved by the care and daily observation in institution and hospital work of cases that have later come to autopsy.

Consider briefly, for illustration, the gravest cases—cases which at autopsy show most extensive ulceration of the intestine. In many of these there has been a low temperature,—from 100° F. to 102° F.,—and the stools have never contained a particle of blood. In others in which perhaps considerable blood has been passed for several days, there is but a mild congestion of the mucous membrane of the large intestine. In still other cases which continue for a considerable time,—from two to three weeks,—with moderate temperature, death results from exhaustion, and autopsy shows nothing but an enlargement of the solitary follicles, with areas of congestion in the lower portion of the small intestine.

Acute ileocolitis may be the primary intestinal disease. In this condition the temperature is usually considerably elevated at the commencement of the illness—103° to 104° F. After an evacuation of two or three undigested stools the passages consist of light-colored mucus, often streaked with blood, or they are of green mucus and streaked with blood. In some cases there is a considerable hemorrhage. Relaxation of the sphincter and prolapse of the rectum are not at all unusual. The passages are small, frequent, and attended with considerable pain and tenesmus. I have repeatedly seen from 20 to 30 such passages from one patient in twenty-four hours.

Far more frequently, however, this condition follows acute gastroenteric indigestion or an intestinal infection, the dangers of which have

not been appreciated, and which, in consequence, has been improperly treated. The lesions produced are due to the bacteria and their toxins, which have abundant opportunity to produce pathologic changes in the intestinal mucous membrane, the extent of which can only be conjectured during life.

An important feature of some of these cases is that an extreme degree of toxemia, with resulting prostration, may be present, with little fever and insignificant bowel symptoms. In other cases the bowel manifestations are very active and the toxemia is slight. The active cases offer the better prognosis. Vomiting may be present at the onset of the attack, but is not usually a symptom of consequence. There is always emaciation. The degree of prostration is dependent upon the amount of toxemia, the extent of the lesion, and the management of the case, particularly as relates to supportive measures and the nature of the nutrition.

Duration.—The duration of an ileocolitis is longer than that of any of the intestinal disorders previously mentioned. With the disease established it is rare for a case to recover under ten days. The duration of the illness is often two or three weeks. I have repeatedly known cases to continue over four weeks. In fact, the duration in many instances is similar to that of typhoid fever. The temperature range is variable—from normal to 104° F. For three or four weeks in a given case there may be a low temperature range—99.5° to 101.5° or 102° F.

Treatment.—Recent work in the bacteriology of the acute intestinal diseases has added nothing to our knowledge as to the treatment of the condition, and consequently does not call for discussion here. Milk is to be stopped at once, whether the patient is breast-fed or bottle-fed. Barley-water, granum-water, or rice-water No. 1 (see formulary, p. 104) constitutes the basis of diet for children under one year of age. Older children may be given the No. 2 mixture. To these carbohydrate foods may be added an ounce of chicken or mutton broth, with salt or sugar to make them more palatable. It is well, for variety, to make up two or three cereal preparations and alternate their use. In this way the foods will be better taken and for longer periods than if but one is prepared. In this form of substitute feeding an amount similar to what the child was accustomed to in health may be given, but the intervals may be shorter by one-half hour or one hour.

To patients of any age Eiweiss Milch, two or three feedings daily, may be given. It supplies additional nutrition, and if the disease is prolonged, there is correspondingly less emaciation. In using the Eiweiss Milch it should at be first diluted with barley-water—¼ milk to ¾ water at first, to be increased to ½ milk and ½ barley-water.

Drugs.—I have had abundant opportunity to test the value of the different drugs advocated from time to time for the treatment of this disease. Drugs which have proved of unquestioned value are castor oil, subnitrate of bismuth, and opium. Drugs which have an occasional application are sulphur and the preparations of tannin. Constitutional

measures, supportive in character, such as heat and stimulation, are, of course, used when indicated, as in any severe exhaustive illness.

At the commencement of the attack two drams of castor oil should be given. If this is not retained, from one to two grains of calomel should be given in divided doses—$\frac{1}{4}$ grain every hour. In cases with considerable fever and infrequent stools it is well to repeat the oil or give some other laxative, such as magnesia, every two or three days.

Bismuth subnitrate is best given in 10-grain doses according to the suggestions on p. 202. If black stools do not follow its administration, one grain of precipitated sulphur is added to each dose. To be effective, the bismuth must be given in large doses. Two or three grains at intervals of two or three hours are of no value. In cases over one year of age 15 to 20 grains are frequently given at two-hour intervals. I have used hundreds of pounds of bismuth in children during the past twenty-five years, and have yet to see harm resulting from its use. Of course, the physician must use a pure article. Not a few cases do admirably under the cereal-water diet, castor oil, bismuth, and sulphur. Tannalbin, in doses of 2 grains in infants, and from 5 to 8 grains in older children, is sometimes of service when there is a tendency to large watery stools or stools containing large quantities of mucus. This also may be given at the same time as the bismuth.

When there are much pain and tenesmus, with frequent, scanty, mucous stools, opium may be used with advantage, with a view to controlling the tenesmus and diminishing the frequency of the stools. Paregoric or Dover's powder is usually selected for this purpose. Dover's powder is preferred, because of the absence of a disagreeable taste and the convenience of its administration. It may be added to the bismuth at each dose, not combined with it in a prescription, for uncombined it may at once be discontinued or given in smaller doses with a diminution in the number of the stools.

Careful instructions should be given when prescribing opium. It is to be given for a definite purpose—to prevent straining and the frequent passages due to excessive peristalsis. As in the treatment of acute intestinal infection, particularly if there is temperature, it is not well to attempt to reduce the number of the stools below four or five in twenty-four hours, and, of course, opium is not to be given at all unless the stools are very frequent. The amount of opium that will be required in a given case may readily be determined by carefully watching the character and frequency of the stools. For children under one year of age the dosage of Dover's powder is from $\frac{1}{8}$ to $\frac{1}{2}$ grain at two-hour intervals, not more than 7 doses being given in twenty-four hours. From the first to the tenth year the dose ranges from $\frac{1}{2}$ grain to 2 grains. Mothers and nurses should be instructed that when there is a rise in the temperature, or when the child becomes drowsy after its use, the opium is to be discontinued or the dose reduced one-half—another advantage of giving it independently. The younger the child, the greater caution to be observed in its use.

When heart stimulants are necessary, the tincture of strophanthus

is usually selected. Digitalis is not well borne by the stomach; and for the same reason, as well as because of its unfavorable effect upon the kidneys, alcohol should be given with caution. When used, alcohol should be well diluted and given only temporarily—during the urgent period of acute toxemia. Its prolonged use invariably interferes with the stomach function.

Caffein sodium salicylate, in ½- to 1-grain doses at two-hour intervals, and atropin, $\frac{1}{1000}$ to $\frac{1}{600}$ grain at four-hour intervals, are particularly useful in the asthenic cases. For threatened collapse camphor, 1 to 2 grains hypodermatically in oil, answers well but requires frequent repetition at one- to two-hour intervals. Adrenalin 1:1000 in 2 to 5 drop doses, by stomach or hypodermatically, is also of much service in collapse.

Hot Applications.—Hot stupes or hot compresses to the abdomen are often most grateful to the patient when there are abdominal pain and tenesmus. The hot applications should be changed every fifteen or twenty minutes, never being allowed to become cold.

Colon irrigation should be used at least once in every case of colitis, normal salt solution being employed at 100° to 105° F. The solution should always be used warm, as it has a pronounced sedative effect in some patients when used in this way, and thus may fulfil two purposes. Whether the irrigation is repeated or not must depend upon its effect upon the patient. When he strains against it and there is no apparent diminution in the number of the stools, it should not be repeated. Frequently, however, the intestine remains quiet and the number of passages is diminished after a warm irrigation—105° to 110° F. In such cases it may be repeated twice daily. In cases in which there is not an active bowel action, and decomposing blood and mucus are removed by the washing, it may be used once or twice daily.

Only in the rarest instances, when there is high fever and bowel action is delayed, should intestinal irrigation be practised oftener than once in twelve hours. This line of treatment is often overdone. Irrigation should always be used for a definite purpose, and discontinued when that purpose is accomplished. Every year, at the close of the heated term, I see cases of chronic colitis without fever which are being treated by irrigations two or three times daily without any indication for the irrigation other than the mucous stools. Irrigations, without question, help to keep up the secretion of mucus, for I have repeatedly seen it disappear entirely in a few days without other treatment after the discontinuance of the irrigation. When irrigation is practised frequently in those with inactive peristalsis, it is possible to produce a general edema due to the absorption of the fluid. This has been done experimentally in well children.

Starch and Opium.—The time-honored remedy—the injection of starch and opium—may be of service in the cases in which there is much tenesmus, with the passage of small amounts of blood-streaked mucus or the discharge of bloody mucus from the rectum. In these cases the principal lesions are usually located in the sigmoid and rectum.

A straight-pipe, hard-rubber syringe answers best for this purpose (Fig. 13). A starch solution of the strength of 1 dram of starch to 1 ounce of boiled water is used. For infants under one year of age 5 drops of laudanum may be added to 2 ounces of the starch solution, and repeated at intervals of six to eight hours. Older children may be given from 8 to 12 drops of laudanum with 4 ounces of the starch solution; this may be repeated in four to six hours.

Serum Treatment.—The serum treatment is without value.

Improvement in the colitis is indicated by a subsidence of the temperature, a change in the character of the stools from green or clear mucus, with blood and scarcely any odor, to passages which gradually take on a fecal odor and show the presence of feces mixed with mucus.

The Influence of Climate.—When the case is under control, a change of climate is most beneficial. A child who has had colitis at the seashore or in town will invariably have recovery hastened by a removal inland to the mountains or among the hills, where an open-air life is to be insisted upon.

Diet in Convalescence.—With a subsidence of the fever and an improvement in the number and character of the stools the patient's troubles are not over. The problem of nutrition is often a difficult one. The child has necessarily been on a reduced diet for several days—often for two to three weeks. If better nutrition than cereal gruels and Eiweiss Milch is not soon forthcoming, the patient faces the danger of malnutrition and marasmus, which is the outcome in not a few of the badly treated cases in which the disease is not quickly fatal. The use of fresh milk must sooner or later be attempted.

In all these cases the child has not been getting sufficient caloric units for maintenance of weight. This applies particularly to children, who, on account of age or refusal to take it or intolerance, have not had the benefits of Eiweiss Milch.

Children who have had colitis bear fat badly. The younger the child, the more certainly is this the case. This has been so forcibly impressed upon me that I have discontinued attempts at feeding these convalescents, even with small quantities of whole milk. I have found that they do best on a carbohydrate gruel as a basis of diet, to which sugar-of-milk is added in the proportion of from ½ to 1 ounce to the pint, thereby furnishing material for heat and energy. To this sugar-cereal combination, skimmed milk in small quantities is added, not over ½ ounce, and that to only one of the feedings, the first day that milk is given. If this causes no inconvenience, an increase of ½ ounce is made at every second feeding the following day, and an increase of ½ ounce at every feeding the third day. The total quantity of food given at each feeding is to remain the same, an equal quantity of the cereal diluent being removed to make way for the milk increase. Thereafter, if all goes well, an increase of ½ ounce is made in each feeding every day until the child is taking his daily feedings of skimmed milk one-half strength. In some cases it may be found that the child's capacity will be only 2 ounces of skimmed milk at a feeding with the cereal-water

diluent. Here he must be held, perhaps, for a week or two before milk can safely be advanced. Usually the younger the child, the more difficult will be the resumption of the milk diet. After the first year the nutrition may be assisted by a thick gruel, such as No. 2 (see formulary, p. 104), zwieback, bread-crusts, or rare scraped beef—two or three teaspoonfuls daily, with a couple of feedings of Eiweiss Milch or buttermilk. By infants under one year of age who cannot take even a weak dilution of skimmed milk, granum No. 1 (p. 104) will usually be well taken. If there is abdominal distention from starch indigestion, the granum may be dextrinized. Barley-water also answers well as a diluent for evaporated milk. In adding evaporated milk to the cereal water sugar is to be omitted. The evaporated milk may be increased slowly until from 1 to 4 drams are given at a feeding. Under no ordinary considerations, however, should this diet be permanent. After from two to four weeks the use of plain milk should be attempted, replacing one feeding of the evaporated by a small amount of plain milk—½ to 1 ounce is the customary diluent.

Obstinate constipation sometimes follows recovery from severe ileocolitis. This is to be managed along the lines laid down for the management of constipation (p. 242). Following an attack of ileocolitis the patient must never be allowed to pass twenty-four hours without an evacuation of the bowels. A standing order should be given that an enema should be used when this does not occur.

CHRONIC ILEOCOLITIS

Cases of chronic ileocolitis coming under my care have invariably been preceded by acute attacks that were unusually severe or that were badly managed. These cases represent one of the forms of malnutrition, but are of such a nature as to require special consideration.

The walls of the intestines are thickened with connective-tissue formation, and the solitary follicles have undergone pigmentation as a result of hemorrhages.

Symptoms.—The patient is emaciated, and often three or four pounds under weight; the skin is dry and rough; the circulation is poor; the extremities are cold, and the temperature is often subnormal, showing an occasional sharp rise. The abdomen is always distended with gas. The stools usually are loose, number three or four daily, and contain mucus in considerable amount. The mucus may be absent for two or three days; then there will be a rise in temperature to from 102° F. to 105° F., and large quantities will be passed with a very foul odor. The nervous symptoms are usually marked. The child is irritable and sleeps poorly. He cries a great deal, is very unhappy, and looks as wretched as he apparently feels.

In assuming the care of one of these cases it is well to inform the parents that a rapid improvement is not to be looked for. A patient aged three and one-half years, who eventually recovered, weighed but 23 pounds—2 pounds less than when she was eighteen months old.

During the first six months that I treated her there was very slow improvement, in spite of every advantage that care and change of climate could afford.

Treatment.—The management consists in a proper diet, change of climate when possible, and supportive measures. It is for the physician to find out in a given case what means of nutrition are best. These cases vary considerably in their digestive possibilities, with the exception that they all bear fat foods badly.

Diet.—Chronic colitis is very fatal in young infants, and but few survive. By far the best food for infants under one year of age is breast-milk, which at first must be given in small quantities. Sugar-water should be given before the nursing. These young infants do not do well on starchy foods unless they have been dextrinized (p. 104); when predigested, they may have too laxative an effect, and should be given in small quantities. The use of starch, therefore, in these cases, for a considerable time at least, is limited.

Eiweiss Milch and buttermilk have failed me absolutely in feeding these young children. The patient may be able to digest the unsweetened condensed milk in the proportion of 1: 6 or 12 of water or weak gruel diluents. Two or three feedings a day may be given in alternation with a dextrinized gruel. The addition of ½ ounce of gelatin to the pint of food makes a desirable addition to the feeding of malnutrition cases in which food of low caloric value is necessary.

The beaten white of egg may be given in diluted skimmed milk or in dextrinized gruel No. 3 (p. 104) if it agrees, or in plain water with salt added. The whites of two or three eggs may thus be given daily with benefit. For older children, after the first year, skimmed milk, Eiweiss Milch, rare scraped meat, junket, and coddled white of egg or raw egg are usually best. Zwieback or bread-crusts may be given in small quantities. Alcohol, if given at all, should not be long continued, as cases readily develop the alcohol habit. The feedings are necessarily more frequent than for well children. I usually feed these patients five times a day, at four-hour intervals.

There should be a standing order for an enema after an interval of twenty-four hours if no movement from the bowel takes place during that time. Absence of bowel movement in these cases almost invariably is followed by fever, prostration, and perhaps convulsions. If there is a tendency to constipation, as there will be in some cases, some laxative, such as magnesia or the aromatic fluidextract of cascara, should be given daily in sufficient amount to insure at least one free evacuation.

Irrigation of the colon is not to be used as a routine measure. It is indicated whenever there is a rise in temperature, even though the bowels have moved but a few hours previously. A laxative, preferably castor oil or calomel, should also be given.

The further treatment calls for salt baths, oil inunctions, and the open-air life referred to in the section on Malnutrition, p. 90.

MUCOUS COLITIS

Mucous colitis is a chronic catarrhal condition of the colon, characterized by the production of very large quantities of mucus. The mucus forms a pseudomembrane over the mucosa, and is passed in the form of casts or large, worm-like masses.

Attention has elsewhere been called to the necessity, in dealing with some of the diseases of children, of ignoring what appears to be a local manifestation of disease, and treating the patient along dietetic and hygienic lines. This necessity is in no instance better illustrated than in mucous colitis, a disease fortunately rare in children, yet of sufficient frequency to warrant our attention.

The patients who have come under my care have invariably been of a pronounced neurotic type, usually of neurotic ancestry, and invariably from a neuropathic environment. It is quite usual to find that a considerable quantity of milk has been taken daily.

Symptoms.—The disease rarely follows an acute inflammatory process in the intestine. In the majority of instances there is a history of obstinate constipation in a markedly neurotic, underfed child. Constipation may have existed during the patient's entire life. Almost without exception the treatment which has been followed has consisted in the use of colon irrigations and various kinds of astringents, such as solutions of tannic acid, nitrate of silver, etc. In children with mucous colitis the appetite is capricious, the bowels are usually constipated, and the disposition is chronically irritable. These children are apt to complain of ill-defined pains in the abdomen, which are never very severe and are not necessarily associated with the taking of food. There is usually slight generalized abdominal pain on pressure. A child four years of age, under treatment at the present time,—the most pronounced case that I have ever had under my care,—has never had the slightest evidence of pain of any character. With the dejections there is usually mucus in considerable amount, which is occasionally passed in large masses, at other times in long, tenacious strings, sometimes refered to as "ropy." During a period of several consecutive days little or no mucus may be passed; then large amounts will suddenly appear.

Treatment.—These cases respond most quickly when local measures which often act as irritants to the intestinal mucous membrane are discarded. Usually, as a result of previous treatment and because of the nature of the disease, the constipation is most obstinate. To prevent this I use an injection of two to three ounces of olive oil at bed-time, the tube being introduced 8 inches into the bowel (p. 242). After breakfast on the following morning the child is placed at stool, and if no passage occurs within fifteen minutes, a glycerin suppository is inserted. By this means one passage daily is insured, and this, ordinarily, is all that is required. The use of the suppository is to be discontinued after a very few days, as soon as the habit of evacuation at a certain time is established. Should this method fail, from one to two drams of the aromatic fluidextract of cascara may

be given in addition, at bedtime, this medication being gradually diminished and discontinued as soon as it is demonstrated that an evacuation will occur without medicine. A remedy of considerable value is the liquid albolene (aromatic), given in dosage of ½ ounce to 2 ounces at bed-time, and continued in gradually diminishing doses until the stools are free. Local measures other than those suggested for constipation are not to be employed.

Diet.—Not infrequently these patients have been taking a considerable amount of milk. This is immediately discontinued. In its place malted milk or whey is given. The further diet consists of whole-wheat bread, animal broths, cereals cooked three hours, eggs, poultry, red meat, stewed fruit, and fruit-juices. Spinach, stewed carrots, and asparagus-tips are the only vegetables allowed at the beginning of the treatment, and these by no means always should be given. Purée of peas, beans, and lentils may be given freely. The use of butter is also encouraged. I endeavor to have the patient take three ounces daily. It may be given on bread or on the cereal.

Drugs.—Strychnin and nux vomica appear to exert a very beneficial influence on these cases. The combination of nux vomica and quinin has been very satisfactory. For a child from five to ten years of age the following should be ordered:

℞ Tincturæ nucis vomicæ . . . . . gtt. xc
Quininæ bisulphatis . . . . . gr. lx
M. div. et ft. capsulæ No. xxx.
Sig.—One capsule after each meal.

A child suffering from mucous colitis invariably shows a considerable degree of malnutrition. For details respecting sleep, rest, exercise, and baths, all of which are more important than medication, the reader is referred to the section on Tardy Malnutrition (p. 92).

HIRSCHSPRUNG'S DISEASE (IDIOPATHIC DILATATION OF THE COLON)

Two forms of Hirschsprung's disease are recognized—the congenital and the acquired.

The condition is rarely encountered—probably not over 100 cases are to be found in the literature. Only two well-marked cases have come under my observation. There is an enormous dilatation and hypertrophy of the colon without constriction. The greatest dilatation is found in the transverse and descending colon. In the cases described by Hirschsprung there were ulcerative processes in the mucous membrane and submucous abscesses.

Etiology.—In all cases the condition is probably based upon congenital structural defects.

Symptoms.—The prominent symptoms are obstinate constipation, symmetric enlargement of the abdomen (Fig. 19), and malnutrition.

The bowels may act only once in three to six weeks. Complete obstipation of two to three months' duration has been reported (Cautley). Respiration is often impeded because of pressure on the diaphragm.

For a like reason the heart action may be interfered with. The hepatic and splenic dulness is obliterated.

Prognosis.—The prognosis for a complete cure is unfavorable. The patient usually succumbs to intercurrent disease.

Treatment.—Little is to be expected from treatment, whether medical or surgical. Various operative procedures have been attempted. The radical operation involving complete removal of the colon has been performed. As long as it is possible to produce an evacuation of the colon the patient may remain in a fairly comfortable condition. Laxative drugs, massage, electricity and colonic irrigations may all prove useful as temporary aids.

Fig. 19.—Hirschsprung's disease.

INCONTINENCE OF FECES

Incontinence of feces is a normal condition during infancy, control being established without training during the second year or earlier. In well-trained infants I have seen the bowel function under perfect control at the third month. This is, however, unusual. With a very little teaching it may be accomplished at the sixth month. Incontinence of feces in older children occurs during acute inflammatory conditions, particularly when the colon is the seat of the lesion. Incontinence may also occur in asthenic states, as in grave pneumonia, in typhoid fever, and in severer types of the exanthemata; and it may occur accidentally as the result of fright, shock, or severe straining. It may result from spinal cord disease or injury, and is sometimes present in spina bifida, in which event the fecal incontinence may be compared to incontinence of the urine. I have seen 5 such cases. In 2 the condition had existed for months. The desire for an evacuation was urgent and without warning, and was uncontrollable.

Incontinence of feces, as a condition independent of early infancy and illness, is of exceedingly unusual occurrence. I have seen but 5 cases—2 in boys, one four and the other seven years of age. In these 2 the condition had persisted for months. The desire for an evacuation came with great urgency and was uncontrollable. In 2 other cases there was occasional incontinence due to a relaxed sphincter, probably produced by frequent irrigations. These responded to the treatment outlined below. In the fifth case there was no response to any treat-

ment instituted. The patient was a boy six and three-quarter years of age, and had suffered from the incontinence for a year and two months. He was under treatment for two weeks; no improvement resulted, and he passed from observation.

Treatment.—The treatment consisted in the removal of green vegetables and fruit from the diet, allowing only a small amount of starches, such as bread, potato, and cereals. Eggs, meat, skimmed milk, junket, custard, etc., were given freely. The medicine comprised 15 drops of the tincture of the muriate of iron in glycerin and water, given every four hours, with 1 grain of Dover's powder and 20 grains of subnitrate of bismuth (Squibb) given three times daily. Cases which do not respond promptly to diet and medication should have the advantage of surgical procedures.

INTUSSUSCEPTION

Intussusception of the bowel consists of a prolapse—an invagination—of a portion of the intestine into an immediately joining portion.

Types.—While certain portions of the intestine are particularly liable to be involved, the invagination may take place in any portion of the gut. Thus the small intestine may be the part involved—the enteric form. The colon alone may be involved—the colic type. By far the most common form is the prolapse of the cecum, and more or less of the ileum into the colon, the valve forming the apex of the tumor. This is known as the ileocecal type.

Invagination Found at Autopsy.—At autopsy it is of most common occurrence to find invagination of the small intestine. I have repeatedly seen 6 to 8 invaginations in one subject. They occur at death, and are of no significance. It is unusual to find more than 4 or 5 inches of the gut involved.

Etiology.—The cause of the intussusception is unknown in the great majority of cases. Various theories have been advanced from time to time, none of which deserves mentioning. Occasionally local causes will explain the condition. In one of my cases Meckel's diverticulum caused the intussusception. In another there was a persistent incomplete reducible invagination of the transverse and descending colon into the sigmoid. It was impossible to keep the parts in the normal position, and laparotomy was resorted to in order to learn the cause of the prolapse. The entire colon was found displaced, the hepatic flexure being bound to the abdominal wall by a firm adhesion one-half inch above the umbilicus. This caused a displacement downward of the transverse and descending colon, which underwent invagination. A case in my service at the Babies' Hospital showed that the invagination had taken place at the site of a large and thickened Peyer's patch in the lower ileum. Here, evidently, the gut was more resistant, and the portion above, during active peristalsis, slipped into the less motile section.

It is peculiar that nearly all the cases occur in well-nourished, vigorous, breast-fed babies.

Age.—The age incidence is striking. The majority of the cases occur between the third and ninth months of life. My youngest patient was ten days old. Holt's statistics of 358 collected cases are as follows:

28	cases under 4 months		18	cases from 10 to 12 months	
113	" from 4 to 6 months		32	" " 1 to 2 years	
71	" " 7 to 9 "		96	" " 2 to 10 "	

Symptoms.—The onset is usually sudden, with evidence of pain and vomiting. A further early and very important sign is the marked prostration, which is much more pronounced than in an ordinary gastro-enteric disease. The child in a few hours may look very ill. There is cyanosis, and the pulse is rapid and small. I have observed this symptom-complex in several cases. The vomiting, which is very active, is repeated at fairly short intervals, and after the stomach is emptied bile-stained mucus is ejected with much straining. Medication, food, and water are ejected as soon as they reach the stomach. There is evident tenesmus; the child strains, and at first passes normal bowel contents, followed by bile-stained mucus, and later clear mucus streaked with blood—a most reliable diagnostic sign. Blood is not always present. In some instances only white, tenacious mucus is passed or removed on the examining finger. The prostration, urgent at the beginning, increases, and the patient may die of shock before operation is attempted.

The Presence of Tumor.—If the case is seen early, a sausage-shaped tumor may be felt, or the rounded apex of the tumor may be felt by rectal examination if the colon is involved. If the patient is not seen until several hours or days have elapsed, the accumulation of gas in the intestines renders the palpation of a tumor impossible.

Occasionally a case is seen in which the onset is more gradual, in which gas and bile-stained mucus will be passed for a day or two. This indicates that the invagination is not sufficient to close the lumen of the gut. Finally, only blood and mucus are passed and the obstruction is complete. Three or four days may be required to bring this about. Vomiting is a less pronounced symptom in these cases of gradual development.

Stercoraceous vomiting does not occur in young infants.

The Temperature.—The temperature range is of no significance. In many cases the temperature is never above 100° F.

Diagnosis.—There is no satisfactory excuse for so many failures in diagnosing intussusception in infants. The reason for the failure to appreciate the condition is because physicians too readily interpret active vomiting, with green mucous and bloody stools, as significant of gastro-enteric intoxication.

Distinguishing features of intussusception are: Vomiting, sudden and urgent, in well infants, who may be breast-fed; shock and collapse out of proportion in severity to the other symptoms; the passage of clear, mucous stools streaked with blood, together with the presence of pain

of a paroxysmal nature, the absence of the passage of flatus, and the sudden distention of the abdomen.

The presence of a tumor which can be felt either by abdominal palpation or in the rectum occurs in perhaps 80 per cent. of the cases. In cases of ileocecal intussusception the tumor may be difficult to map out, particularly if there is much distention of the abdomen. Under these circumstances anesthesia should be used in suspicious cases. Rectal examination is always a valuable aid and should never be neglected.

Prognosis.—The prognosis in the immediate, complete case depends largely upon the time of making the diagnosis and the promptness of operative procedures. The chance for recovery from operation decreases rapidly with each succeeding day.

It is impossible to give statistics of value. It is safe to say that over 50 per cent. of these cases are curable by some means if they are diagnosed early. The high mortality—50 to 80 per cent.—is due to two conditions: the tender age of the patients and the fact that the cases seen in consultation and those seen in children's hospitals usually have been treated for something other than intussusception. Sometimes such treatment has been continued for several days. By the time these cases reach the hands of the surgeon there may be extensive adhesions, gangrene of the involved portion of the intestine, and an exhausted child to deal with.

Treatment.—*Reduction by Water-pressure.*—It is my custom, in any case, first to send for the surgeon and then make one attempt at reduction by water-pressure: A well-oiled catheter, No. 18 American, or a small rectal tube, is attached to the small hard-rubber tip of a fountain-syringe. Two quarts of a normal salt solution are placed in the bag, which is hung at an elevation of four feet above the child's body. The colon, or that part of it below the intussusception, is slowly filled with the warm salt solution. A small wet towel is tightly wrapped around the catheter, and fairly strong pressure is made at the anus by an assistant, in order to prevent the escape of the fluid. With the child on his back with both hands free, the buttocks are elevated on a pillow or bed-pan at a plane 10 inches above the shoulders. In the cases in which the tumor is palpable, an attempt is made, by gentle abdominal manipulation, to reduce the intussusception. This in two cases I have thus succeeded in doing. Prolonged and repeated attempts at reduction should not be practised. An early operation gives the child a far better chance of life than does any temporizing measure.

Illustrative Cases.—Case 1.—A child, two and one-half years of age, was brought to my office at midnight with a history of a severe attack of colic about 9 o'clock, which was followed by severe attacks of vomiting and two stools of mucus and blood. Gentle manipulation of the abdomen showed a large, sausage-shaped tumor, about five inches long, in the left hypochondrium, which I diagnosed as an intussusception. The tumor could not be felt by rectal examination. Water-pressure, as described above, with abdominal manipulation, reduced the intussusception in a few minutes.

Case 2.—The other patient was a baby nine months of age. I saw the child in consultation after the intussusception had existed for six days. The child was unconscious and in profound collapse. He was pulseless, but the heart-sounds could be faintly distinguished by the aid of stethoscope. The rectal temperature was 96° F.

The abdomen was greatly distended. The child had been treated for cholera infantum, although for five days nothing but white mucus tinged with blood had been passed. Palpation revealed a sausage-shaped tumor extending along the entire left side of the abdomen, which, in spite of the abdominal distention, could easily be made out by firm pressure. The child was unconscious, so that there was no resistance to the examination. By rectal examination the projection of the involuted gut, which resembled the cervix uteri, could readily be distinguished. The condition of the child precluded all chance of surgical relief, and I hesitated to use water-pressure, fearing that the gut might be gangrenous and a rupture result, or that there might be adhesions sufficient to prevent reduction, and that the child might die during the manipulations. I explained the situation to the parents, who, after considerable urging, consented to a trial being made. The patient was accordingly given $\frac{1}{100}$ grain of strychnin, 1 drop of tincture of strophanthus, and 30 drops of brandy hypodermically. The water-pressure was applied in the usual way, and it was with the greatest surprise and with supreme satisfaction that I felt the tumor slowly give way, to be followed by an expulsion of gas and a quantity of very fetid fecal matter. A hot colon flushing at 110° F. with a normal salt solution was given a few minutes later. This was all retained, and six hours later 12 ounces more were given. Hot-water bottles and bags were placed about the child. He had sufficiently revived in an hour after the first colon flushing to be able to swallow diluted brandy and egg-water, both of which were freely given. A rapid recovery followed.

This case, to me, was interesting in many ways, particularly as it emphasized what we sometimes see in work among children when victory is snatched from the jaws of evident defeat—that we should never cease our efforts so long as life lasts.

It is my practice to make but one attempt at reduction by water-pressure. When this does not succeed after a five-minute trial, immediate operation gives the patient his only chance of recovery.

CONSTIPATION

Constipation in the young has in many instances been ascribed to the influence of heredity. It is undoubtedly true that a predisposition to deficient musculature in the bowel not infrequently exists apart from other assignable cause. In most cases, however, muscular impairment and atony of the intestine are induced by prolonged improper feeding, constitutional diseases (such as rickets) resulting in deficient general nutrition, or artificial assumption of the normal work of the intestine by the too frequent administration of enemata or suppositories.

Deficient fat content in the milk of young infants, and insufficient solid food in the diet of children over one year of age, probably are responsible for a majority of the cases. The digestive organs demand not only elements for assimilation, but a certain amount of food residue to act as a stimulus to perfectly normal musculature. The results of the absence of a fair amount of this food residue in the diet are most apparent in children between the first and third years, who receive over a quart of milk daily, administered in frequent instalments, and from force of parental habit or perverted desire on their own part are deprived of such important dietetic ingredients as cereals, vegetables, and fruit. Such children are almost invariably sufferers from chronic constipation.

The cases commonly ascribed to deficient secretion on the part of the intestinal glands and liver are also frequently of dietetic origin.

In a few instances mechanical conditions are responsible for the faulty condition. Of these, the most frequent are localized proctitis, fissures and hemorrhoids, and sphincter-spasm. Congenital narrow-

ing of the gut, hernia, and congenital dilatation of the colon (Hirschsprung's disease) deserve merely to be borne in mind in this connection.

Before instituting treatment of any nature it is necessary to know that no mechanical cause exists.

Bowel Evacuation Necessary.—In order to keep the infant or young child in good physical condition, one free evacuation of the bowels is required once in twenty-four hours. While two or three evacuations daily in a nursing or bottle baby may be desirable, this number is not absolutely necessary. When there are more than four passages in twenty-four hours, it means that something is wrong with the intestinal tract. This, however, may not be of such a nature as to require radical means for its correction. Thus, in many nursing babies who are supplied with a high-fat breast-milk, there may be several thin greenish stools in twenty-four hours, in spite of which condition the child thrives satisfactorily. It is well in these cases to attempt to reduce the fat in the breast-milk by measures suggested elsewhere, but by no means should the nursing be interdicted if the baby is making a reasonable gain in weight. The proof of successful nursing is a thriving child, not the character of the stool. The habit of an evacuation at a certain time each day is one of the most important preventives of constipation in an infant. There is a standing order in every household where I have such a patient, to the effect that the child is never to be put to bed for the night unless the bowels have moved during the preceding twenty-four hours. Either a simple soap-and-water enema or a small glycerin suppository is employed. The enema is preferred, from 4 to 8 ounces of the soap-water being used. The suppository is used only when, for any good reason, the enema is not available. Placing the child at stool immediately after the morning bottle is one of the means of establishing the habit of an evacuation at a definite time each day. The child soon appreciates the reason for this position and acts accordingly. This practice may be begun when the child is five or six months of age.

Defective Bowel Evacuation.—Defective bowel evacuation in infants and young children is a form of constipation very apt to be overlooked, and for this reason it is put under an independent heading. As long as an evacuation takes place daily it is supposed to be sufficient. Even though a passage takes place daily and voluntarily, if it is dry and comes away in pieces or in hard balls, or is firmly formed without the moist surfaces caused by the presence of mucus and water, it is practically certain that the evacuation is not complete and that fecal matter is retained in the intestine. This may occur at any age, and when the condition persists, there results, oftentimes, an intestinal toxemia, with the manifestations referred to under that caption. The same methods of treatment are to be followed as suggested for constipation at the various ages of infancy and childhood. Usually, however, in this type of constipation, dietetic measures are sufficient.

Constipation in Nurslings.—There are many nursing infants who are thriving and well in every respect, except that they are constipated.

Bowel evacuation is greatly delayed or does not occur without aid. Our first step in the management of these cases is to examine into the daily life and habits of the mother. A factor in the etiology of constipation in the infant is constipation in the mother. Treatment of the mother will often relieve the child. If, however, the constipation in the mother is not relieved, the subsequent treatment directed toward the child will be much less effective. Nursing women who drink a great deal of tea are apt to be constipated, and their infants are similarly affected. The nurslings of mothers who lead indolent lives, taking but little exercise, are likewise sufferers from constipation.

Treatment of the Mother.—Errors in the mother's diet and habits of life must be corrected and the scheme carried out which is recommended under Maternal Nursing.

When a proper régime for the mother has been established, the breast-milk should be examined (p. 32). While high proteid may contribute to constipation, this factor, in my observation, is rarely a cause. Low fat, from 1.5 to 2.5 per cent., with normal proteid is much oftener found to be present.

Often in such cases the fat in the mother's milk may be increased by the use of some form of alcohol, given with the meals. Wine, beer, ale, porter, or the liquid malt preparations may be given, the mother being allowed to make her own selection according to her taste. The free eating of red meats also increases the fat in the milk.

Several years ago a series of observations were made in the New York Infant Asylum relating to the effects of diet on breast-milk. It was found that in some cases the fat could be increased from 1 to 2 per cent. by the addition of alcohol to the mother's diet. The value of the various galactagogues on the market depends, in all probability, upon the alcohol which they contain.

Treatment of the Child.—A very tight sphincter is the cause of constipation in a small proportion of nurslings; and before beginning other treatment in such cases the sphincter should be stretched by passing a protected index-finger into the rectum. As an aid to nutrition and as a laxative, a valuable addition to the diet of the constipated breast-fed infant, when the mother's milk is found weak in fat, is cow's-milk cream, ½ to 1 teaspoonful of which may be given before every second nursing or before every nursing, according to the age of the child and the capacity for fat digestion. Children during the early months of life take pure cod-liver oil readily, and oil, like cream, may serve the double function of a food and a laxative. Establishing by careful instruction the habit of an evacuation of the bowels at a certain time every day, is a valuable measure.

Drugs.—Drug-giving is rarely necessary in treating young children and should be resorted to only when other measures fail. In case drugs are necessary, those most useful ordinarily are the preparations of cascara sagrada. The aromatic fluidextract (Parke, Davis & Co.) is palatable and may be given in sufficient doses to be effective once or twice daily. The milk of magnesia with equal parts of the aromatic

syrup of rhubarb, given in doses of from 1 to 3 teaspoonfuls daily, is an agreeable and usually an effective combination. The liquid albolene (aromatic), in 1 to 4 dram doses, acting as a lubricant, often gives surprisingly good results.

Enemata and Suppositories.—The use of water enemata and suppositories is not to be advised as a routine measure. The habit of depending upon them is readily established, the bowel, by their frequent use, becomes insensitive to stimulation, and in a few weeks they fail to act. I have had many mothers come to me in great distress when this stage was reached. When the stool is dry and hard and is passed with difficulty, the injection of two ounces of warm sweet oil at bedtime is of advantage. This is not intended to produce an immediate evacuation, but rather to act as a lubricant for the evacuation expected the following morning.

Malted Foods.—It is elsewhere advised that the nursing baby be given one bottle-feeding daily. The malted proprietary foods are distinctly laxative to many children. It has long been my custom, when, in a nursing infant, a condition of constipation exists which is not relieved by careful regulation of the mother's diet, to prescribe one feeding of malted milk daily, in the strength of one teaspoonful to an ounce of water. Some children will not take malted milk of this strength, as the sweet taste is objectionable. In such cases it may be given weaker at the beginning, or it may be given in a milk mixture suitable to the age of the child. When it is used in this way, there should be no addition of sugar. Malted milk or Mellin's food may be used in a quantity equal to that of the sugar.

Massage is a most valuable means of treatment in the constipation of older children, but in nurslings and in the bottle-fed of tender age, on account of the restlessness and crying, it is not generally practicable, and to be effective it should be given only by those skilled in its use; therefore, unless the case is an extreme one, and all other measures have failed, massage is not to be employed in the very young. I have never seen any benefit from the abdominal manipulations attempted by the mother or nurse.

Constipation in the Bottle-fed.—Before undertaking the treatment of constipation in any infant the rectum should be examined to determine the presence or absence of sphincter spasm (p. 236). In the bottle-fed, inactivity of the bowel is more easily managed than in the nursling, because, in dealing with the former, we are in a better position to adapt the food to the child's digestive peculiarities. As a rule, constipated bottle babies should have a reasonably high fat—3.5 to 4 per cent.—and sugar up to at least 7 per cent. This rule, however, is open to exceptions; a few of the most obstinate cases of constipation that have come under my care have been fed on a very high fat, the constipation being due to fat indigestion. It is extremely rare to find a child who can digest, day after day, a milk mixture containing more than 4 per cent. of cow's-milk fat.

The Proteid.—Cow's-milk casein, although probably the most fruit-

ful factor in causing constipation in bottle-fed babies, nevertheless is necessary for the child's nutrition. A considerable reduction, such as may be obtained by giving a mixture of cream, sugar, and water, may relieve the constipation, but the child thus fed will suffer from a nutritional standpoint, and instead of being constipated will become rachitic, which is much worse. In not a few instances I have seen malnutrition result from cutting down the proteid in the effort to relieve constipation.

The child's growth and development must never be held subservient to anything else. A child under six months of age will not thrive satisfactorily on less than 1 per cent. of proteid as found in cow's milk. He is entitled to at least 1.5 per cent., and thrives best when this amount is given. The relief of the constipation can in almost every instance be accomplished by other means than a too great reduction in the casein—the most nutritive element in the infant's food.

Milk given constipated infants should always be raw, as cooking increases its constipating tendency.

Laxative Agents in the Food.—The simplest means of treating constipation in the bottle-fed is by the employment of a laxative agent in the food, and when such an agent adds to its nutritive value, it serves a double purpose. Instead of water as a diluent, oatmeal-water No. 1 (see Formulary) may be employed. The malted proprietary foods, such as Mellin's food and malted milk, are laxative to most children. Mellin's food is composed largely of dextrose and maltose, which are laxative sugars, and therefore may be used in place of sugar-of-milk or cane-sugar in the food mixture, for the purpose of relieving constipation. In some instances I substitute a feeding of malted milk with from 4 to 8 ounces of water once daily for the regular milk food, the quantity and strength depending, of course, upon the age of the child.

Drugs and Local Measures.—Dietetic measures should always be tried before drugs are resorted to. One or 2 teaspoonfuls of milk of magnesia in one bottle daily may be recommended as a temporary expedient in some cases. The magnesia may be of service until the condition is controlled by the diet. The aromatic fluidextract of cascara sagrada, in doses of from 15 drops to one dram, may be tried if success does not follow the use of the magnesia.

Water enemata and suppositories should be used only as temporary measures. Orange-juice, 2 teaspoonfuls twice daily before feedings, is worthy of trial, and is of antiscorbutic value for children artificially fed. Sweet oil and the pure cod-liver oil may also be used in doses from 30 drops to 2 drams, three times daily, after feedings. Oils produce beneficial effects not only as laxatives, but also as aids to nutrition. Acting purely as a lubricant, liquid albolene (aromatic) in dosage of 2 drams to ½ ounce, once daily after the evening meal, is of much service in many cases.

Oil Injections.—In case the stool remains hard and dry in spite of the above suggestions, an injection of 2 ounces of warm sweet oil

(p. 242) may be given at bedtime every night, not with a view to inducing a passage at the time, but as a lubricant to the parts and as a solvent of the hard fecal masses.

Constipation in Older Children.—*Etiology.*—Probably the most potent dietetic factor in causing constipation in children of the "runabout" age is the use of full milk, crackers, and dry bread-stuffs. Particularly is this apt to be the case if the milk is boiled. Constipation may also be occasioned by too great concentration of the food, insufficient volume being furnished to produce copious evacuations.

Local Causes.—In a great majority of children the freer feeding following weaning from the breast and bottle relieves the tendency to constipation from which many suffer during the earlier months of life. In a small percentage of cases, however, such relief is not furnished, and the child will require the attention of a physician. In making the physical examination of a case of this nature, special care should be directed toward the examination of the rectum, in order that local causes, such as fissures or hemorrhoids, may be eliminated. If fissures are present, the child will use every effort to prevent a bowel movement.

Regular Habits.—As a rule, children who are presented for treatment after the second year have not had the benefit of carefully regulated habits of life, so that our first step is to correct bad habits that may have a bearing on the condition, and to teach good habits. The desirability of establishing in the child the habit of a bowel evacuation at a certain definite time every day should be impressed upon the mother or nurse. In order to bring this about, an attempt should be made to induce a movement of the bowels by voluntary effort every morning after breakfast. Not a few children are too busy, too active in their play, to respond to the call of nature when it comes, and if it can be repressed, they say nothing about it. If a certain time of the day is selected for the evacuation, and if the child is required to remain at stool until it occurs naturally, or by means of a suppository after fifteen minutes have elapsed, much is accomplished by this means alone toward establishing the habit.

Diet.—Ultimately, much may be accomplished in these cases by diet. Foods other than milk may now be given, so that a high-proteid milk, rich in casein, is not necessary. As it is desirable to continue the use of milk at this age, the following combination of top milk and water may be used instead of full milk: A quart bottle of milk is allowed to stand at a temperature between 40° and 50° F. for five hours, after which the top 10 ounces are removed with a Chapin dipper. (See Fig. 8, p. 60.) The 10 ounces of top milk are mixed with 20 ounces of oatmeal gruel or plain boiled water and given as a drink.

The giving of high-fat mixtures in constipation is sometimes overdone even in feeding older children. We seldom find a child five years of age who can digest, day after day, a milk or cream mixture contain-

ing over 4 per cent. of fat. Attacks of acute indigestion and faulty nutrition are very apt to result when too high a fat is persistently given. In not a few instances I have seen grave malnutrition result from an attempt to relieve the constipation by high-fat feeding. It must also be remembered that high-fat mixtures, if given to children of any age, may produce constipation, with hard, very light colored, and usually foul-smelling stools. By using the top milk, diluted, we give a sufficient amount of fat and relieve the constipation by removing a considerable percentage of the casein, the usual constipating element, the percentage of which in the 30 ounces of food, above referred to, is but one-third that in full milk. Of course, the nutritive value of the dilution is less than that of full milk, but the child is now at an age when proteid can be given in other forms than in the milk.

Diet After the Second Year.—White wheaten bread, wheaten flour crackers, with full raw milk should form no part of the dietary of these patients. It is best to give to parents of children we are treating for constipation a list of permissible articles of food from which suitable meals may be prepared. The following articles of diet may be allowed:

Animal broths, purées of peas, beans, and lentils.
Rare roast beef.
Rare steak.
Hashed chicken.
Lamb chops.
Soft-boiled eggs.

Green vegetables, such as:

Peas.
String-beans.
Spinach.
Asparagus.
Strained stewed tomatoes.
Cauliflower, mashed.

Cereals, as follows (each cooked for three hours):

Cracked wheat.
Oatmeal.
Hominy.
Corn-meal.

The cereals may be served with a small amount of milk and sugar, or, better, with butter and sugar.

Bran biscuits.
Oatmeal crackers.
Graham wafers.
Zwieback.
Whole wheaten bread.

Desserts:

Stewed rhubarb.
Stewed or baked apple.
Stewed prunes.
Custard.
Corn-starch.
Plain vanilla ice-cream.
Junket.

Malted milk may be given as a drink. Six teaspoonfuls of malted milk in 8 ounces of hot water may be given once or twice daily. An agreeable change in the taste of the malted milk may be made by the addition of a teaspoonful of cocoa. If milk is given as a drink, the top 10 ounces from a quart bottle should be used as described above, mixed with 20 ounces of boiled water or oatmeal jelly.

A child in fair health after the second year usually thrives best

on three meals daily. If he is delicate, or if a fourth meal does not interfere with the appetite for the other meals, it may be allowed. The extra meal, however, should be light, and is best given between 2 and 3 o'clock in the afternoon. For a child suffering from constipation, this meal may consist of a cup of broth with a graham or oatmeal cracker. Orange-juice or a scraped raw apple may also be given at this time. When only three meals are allowed, the orange-juice or scraped apple should be given in the afternoon about two hours before the evening meal. The giving of the fruit-juice or the apple on an empty stomach is a valuable aid in relieving chronic constipation. These patients should also be encouraged to eat plenty of butter. The use of olive oil internally is of as much service here as in treating bottle or nursing babies. From 2 to 3 teaspoonfuls are given after each meal. Oil is usually well borne by the stomach; in fact, many children become very fond of it. Inasmuch as it is more of a food than a medicine, its use may be continued for months if necessary.

Diet After the Fifth Year.—Permissible articles for a child of from five to ten years of age include those mentioned above, with the addition of dates, figs, raw and cooked fruits, baked and stewed potatoes, meats, baked and broiled poultry, and fish. The latter should be served plain, without sauce. Plain puddings may also be allowed. One or two raw apples, an orange, or a large peach or pear should be given every afternoon. It is not promised that in a case of chronic constipation the above diet will at once produce normal bowel movements. The diet must be continued for weeks in some cases before marked benefit will be observed; in others the results are very prompt and satisfactory.

Local Measures.—Enemata and suppositories will be necessary at first, until the habit of an evacuation of the bowels at a certain time every day is established.

Drugs.—Drugs may be of temporary service. The cascara preparations are the best for this condition. If the child can swallow a pill or a tablet, the drug may be given in this form. The 1-grain tablets of cascara may be ordered, and the nurse instructed to give from one to three or four at bedtime. If the drug has been properly prepared from the well-seasoned bark, a reasonable dose will occasion no griping, and the amount given on succeeding nights may be diminished instead of increased, as is often necessary with many other laxatives. A most satisfactory form of medication in my hands has been the following combination:

℞ Sodii bicarbonatis..... ℥ij
Syr. rhei aromatici
Fluidex. cascaræ sagradæ (aromatic) .....āā ℥ij
M. Sig.—½ to 1 teaspoonful after each meal.

After the diet and habits of life have been arranged, the mother or nurse is instructed to give the prescription three times daily after meals, in sufficient amount to produce at least one free evacuation daily. The mixture is very pleasant to the taste and is well taken.

As its administration is continued, less will be required, but it is to be insisted upon that the medicine be given three times daily, even though the dosage be reduced to three drops at a time. There is always a temptation on the part of those in charge of the patient to give one large dose at bedtime. The results are not as satisfactory when this is done. In a vast number of cases I have been able, with intelligent home coöperation, to discontinue the medication entirely after a month or two.

Castor oil, calomel, or podophyllin should never be given without other indications than simple constipation. In the cases in which the stools are soft, but difficult of passage because of deficient peristalsis, the tinctures of nux vomica and belladonna may be given with benefit if continued for a considerable time. A child three years of age may be given 3 drops of the tincture of nux vomica and 2 drops of the tincture of belladonna 3 times daily in tablet, capsule, or liquid form. The constipation which accompanies mucous colitis is referred to under that heading. The liquid albolene (aromatic) may also be used in these patients. A large dose may be required at first—perhaps one to two ounces at bedtime.

Treatment of Obstinate Constipation.—Despite both diet and drugs, we meet, at infrequent intervals, cases without structural deformity, which resist our every effort. Drugs, attempts at habit-forming, and diet have been used and have failed; only the most radical measures furnish relief. In such cases of obstinate constipation I omit the use of laxative drugs and employ the following management.

Diet.—Milk and cream are prohibited except in sufficient amount to make the morning and evening cereal palatable. For this purpose not over two ounces of milk are needed. I prefer that cereals be taken with butter and sugar. Aside from practically cutting off milk from the diet, the dietetic measures are the same as mentioned above.

Oil Injections.—For this purpose a soft-bulb syringe of four ounces capacity is ordered. Over the hard-rubber tip is placed the cut end of a small-sized adult rectal tube or a No. 18 American catheter, which has been cut so that but nine inches remain for use (Fig. 20). A fountain syringe is impracticable for this purpose, as it is soon destroyed by the oil and rendered unfit for use. Besides, sufficient pressure is not thus produced to force the oil into the gut even with a high elevation of the bag. The child is placed on the back or on the left side, preferably in the Sims position. The syringe is filled with oil, the tube is lubricated, and passed through the rectum on into the descending colon. When it has been passed to the full nine inches, as may readily be done with a little practice, the syringe is emptied and the tube is withdrawn. The injection should be given after the child has been placed in bed for the night. It is our object to have the oil retained during the night. If a passage of the bowels is produced at the time, or if the oil leaks out during the night, a smaller quantity should be used. In some of my patients I have been able to use but one ounce. In very few, indeed, does the oil cause an evacua-

tion at once. If there is a tendency to leakage, a napkin should be worn to avoid soiling the bed-linen. If the oil is simply placed beyond the internal sphincter, it will rarely be retained during the night, or if retained, the results are by no means as good as when it is placed in the descending colon. The following morning, after breakfast, the child is placed on the vessel and kept there until a bowel movement results, or until fifteen minutes have elapsed. In a great many cases in which the constipation has been obstinate for months the bowel will at once be evacuated. When this does not occur in fifteen minutes, a glycerin suppository is inserted, which invariably produces an evacuation. This use of the suppository, according to my observation, can usually be dispensed with in a very few days; the use of the oil, however, may have to be continued for several weeks. When the

Fig. 20.—Bulb syringe and catheter for oil injection.

child has had the oil nightly and an evacuation the next morning without assistance for two weeks, I direct that the oil be omitted for a night and the effect noted. If the usual passage occurs after breakfast, the oil is given for five nights and then again omitted. If the case progresses satisfactorily, the use of the oil is gradually stopped, the injection being given at first every second night, then every third, fourth, or fifth night, etc. A considerable number of cases have been completely relieved in two months. In the event of no passage following the omission of the oil, its use is continued for two weeks longer, when it is again omitted for a night. To illustrate this point the following case is cited:

Illustrative Case.—A boy, three years of age, had never had a bowel evacuation without drugs, soap enemata, or suppositories since birth, and finally these were no longer effective. The mother, thoroughly frightened, brought the child to me.

Eight months of diet and the use of the oil were required before he was entirely well. It is now three months since the local treatment was discontinued and the bowel function remains normal.

The diet with the absence of milk must be continued for months after the patient is apparently well, and he must not be allowed to pass a single morning without an evacuation at the usual time. In assuming the management of one of these cases I explain to the mother or nurse that the treatment is not pleasant for the child or the attendant, that it may have to be persisted in for weeks, and unless she is willing to carry it out to the end, it had better not be undertaken. I assure her, however, that with her coöperation, which is usually readily given, the child will make a complete recovery. In cases that are slow in responding to treatment, I usually give the additional advantage of abdominal massage, from twenty minutes to one-half hour before the child is placed at stool. The massage should be practised by one skilled in the work.

The above local measures apply particularly to children after the eighteenth month. They may be used earlier, however, following out the diet along the lines laid down for bottle-fed children who suffer from constipation. In very young children a smaller amount of oil should be used—never more than two ounces, usually one ounce is all that is required. When the oil treatment is under way, whatever the age of the patient, laxative drugs should not be given.

INTESTINAL OBSTRUCTION

Agencies impeding or preventing the normal evacuation of the bowels may be either congenital—due to a malformation of some portion of the intestinal tract—or they may be acquired. Congenital malformation may be found in any portion of the tract, but exists most frequently at or near the outlet, or in the region of the duodenum. Silverman states that 42 per cent. of the cases of congenital malformation involve the duodenum. Obstruction at the outlet of the bowel may be due to an imperforate anus, or the absence of, or atresia of, the lower portion of the rectum. The treatment of this deformity is surgical.

The most common cause of acquired obstruction is intussusception (p. 231). Peritonitis, both acute and chronic, may cause a cessation of bowel action. Tuberculous peritonitis, through the formation of fibrinous bands and adhesions, may cause sufficient constriction of the gut to prevent the passage of the intestinal contents. In such cases, also, relief is best furnished by surgical measures.

Acute infective peritonitis (p. 255), producing a complete cessation of peristalsis, acts indirectly as a means of preventing the normal passage of the bowel contents. The infection is usually secondary. Operative procedures may be attempted, but all my cases have been fatal. Two underwent operation, as it was feared there might be an intussusception or a volvulus. In one case peritonitis followed pneumonia, the infection being due to the pneumococcus.

Strangulated hernia is a condition by no means difficult of diagnosis and demands prompt surgical relief.

Intra-abdominal tumors, such as sarcoma of the kidney and hydronephrosis, may cause obstruction through pressure on the intestine.

Illustrative Cases.—Fecal impaction was found in two of my cases of intestinal obstruction. Both were seen in consultation. There had been prolonged constipation with insufficient evacuations, owing to neglect on the part of the attendants. The duration of the condition it is impossible to state, as the children were permitted to go to the toilet alone, and as both were under five years of age, but little dependence could be placed upon their testimony. In both cases enemata and cathartics had been tried in vain. There was vomiting and slight abdominal distention. There was no fever and no marked tenderness on pressure. In my opinion, the vomiting was due chiefly to the medication, for it ceased when drugs were discontinued. Both children responded to massage and injections of molasses and water. Eight ounces of molasses and eight ounces of water were introduced by means of a rectal tube at intervals of four hours. One case was relieved after the second injection, the other after the fourth. Massage was early brought into use. This was given for thirty minutes and repeated after an interval of ninety minutes. The interrupted massage was continued until an evacuation occurred.

An unusual case of intestinal obstruction was seen in a wretched, premature infant, five months of age, weighing about seven pounds. The child had a congenital heart lesion and deformities of the ears. He was suddenly taken ill with vomiting, and the passage consisted of pale mucus streaked with blood. No tumor could be felt, but a diagnosis of intussusception was made and the abdomen opened. At the site of the obstruction was a Meckel's diverticulum which had twisted the gut so as to prevent the passage of gas or intestinal contents.

INTESTINAL CYSTS OR DIVERTICULA (CONGENITAL)

A most unusual case of intestinal obstruction recently came under my care. A well-nourished, breast-fed child, five weeks of age, became ill with what appeared to be intestinal indigestion. There was a slight elevation of the temperature, and the stools were green, undigested, and watery. The family physician, Dr. Walter Fleming, of Mt. Vernon, N. Y., treated the case by the usual methods. An improvement in the stool followed, but a marked degree of tympanites remained. Feces and gas were, however, passed in small amounts, and at times the abdomen was sufficiently soft to allow of free palpation. The tympanites gradually increased, and instead of being intermittent, persisted. About one week after I first saw the case it came under my immediate supervision in New York city.

Feces and gas were passed with difficulty—occasionally there was a fairly large stool. The child was in no way ill, and suffered only from the abdominal distention; when this was relieved, the baby took food well and was content. In spite of our every effort as related to diet, medication, local measures to the abdomen, and colonic treatment, the condition of tympanites gradually increased and became permanent and extreme.

The patient was sent, at about the sixth day under my observation, to the Babies' Hospital, where all means and attempts at reduction of the gaseous distention were likewise futile.

An exploratory incision was made into the abdominal wall by Dr. Wm. A. Downes, who discovered a tumor in the cecum. An arti-

ficial anus was made in the ileum above the valve, and the tympanites was relieved; but the child died shortly from exhaustion.

A postmortem examination showed just above the ileocecal valve, and within 5 cm. of it, a round, sessile cyst, 3 cm. long and 2.5 wide by 0.75 cm. high, the mucosa over it thin, stretched, congested at either side, pale on top, with dilated vessels from the base radiating over the sides and top. Immediately beyond was a second cyst, 2.5 x 2.5 cm. and only 0.25 high; close to it, almost bilocular, was a third, 2.5 x 2 and 0.75 cm. high. Contents: mucolymph, lining smooth. Between the mucosa and submucosa the muscle was normal. Next to the last cyst was a part of a Peyer's patch, mucosa congested, walls thickened and edematous. The colon was congested.

The cysts or diverticula had encroached upon the lumen of the gut, and because of their proximity, formed a sufficient obstruction to preclude the passage of gas and the intestinal contents. Evidently the later growth of the cysts was quite rapid, as the obstruction caused symptoms increasing only gradually in severity, and permitted of the passage of feces until a day or two before the operation.

Blackader, of Montreal, reported a similar case before the American Pediatric Society in June, 1913. He was able to find records of but three other cases of congenital intestinal cysts in the literature. The condition, according to Gant, is not uncommon in adults; and in them the cysts are usually found in the sigmoid and colon and are looked upon as acquired.

THE INTESTINAL PARASITES

The most common of the intestinal parasites found in children are Ascaris lumbricoides, or round-worm, Oxyuris vermicularis, or thread-worm, Tenia, or tape-worm, and Uncinaria, or hook-worm.

The Blood in Infections by Intestinal Parasites.—Patients with teniasis or uncinariasis frequently present a pronounced degree of anemia of the chlorotic type. In occasional cases of tape-worm infection the blood-picture resembles that of actual pernicious anemia. Where uncinariasis is prevalent and the inhabitants are subject to constant infection from the soil, such terms as "Egyptian chlorosis," "miner's anemia," and "brickmaker's anemia" are current synonyms for the disease.

Leukocytosis in the parasitic infections is not characteristic, but may occur during the acute stage of trichiniasis. Eosinophilia, however, is a very characteristic manifestation of reaction to the parasitic toxins, and in trichiniasis often attains a degree of 20 to 50 per cent. Stiles reports that in uncinariasis the chronic cases with poor resistance show little eosinophilia, while those undergoing improvement under treatment afford counts averaging as high as 13.2 per cent.*

Ascaris Lumbricoides (Round-Worm).—This parasite is a very frequent inhabitant of the small intestine. The worm is 5 to 10 inches long, cylindric in form, and closely resembles an ordinary earth-worm.

* Osler's Modern Medicine, vol. i.

Large numbers may exist in the same patient, and have been known to cause serious secondary symptoms, such as obstruction of the bile-duct or a severe attack of choking, induced by the migration of the worms from the esophagus into the larynx. They have been known to invade the Eustachian tube. The ova are taken into the digestive tract in uncooked food and occasionally in drinking-water. The eggs are of oval form, and when present in the feces, may be distinguished by their thick shells and "mammillated" borders and by the absence of segmentation.

Symptoms.—The round-worms, if in considerable number, may produce colic or constipation, the latter oftentimes alternating with diarrhea. Nervous disturbances of an urgent character are not uncommon. In the great majority of my cases, however, no symptom whatever was present, and the fact that the child had parasites in the intestine was first learned when a worm was found to have been passed by the rectum. In the case of one of my patients, three years of age, there were repeated convulsions. The mother stated that the child had passed a couple of round-worms the day before. I gave one ounce of castor oil, and after an hour, two grains of santonin. Forty-three large round-worms were passed during the next twenty-four hours. This is the largest number I have known to come from one child. The round-worm is rare in New York city children. I have seen but five cases. In children who live in the country it is of fairly common occurrence.

Treatment.—At bedtime I order from 2 to 4 teaspoonfuls of castor oil. Early the following morning, about two hours before breakfast, santonin is given. To children under two years of age I give 1 grain; to those from two to four years of age, 1½ grains; and after the fourth year, 2 grains. The santonin is prescribed in a powder or capsule, with an equal quantity of sugar-of-milk. If the passage of worms follows its use, the treatment is repeated in three days; and again in a week, if worms are passed after the second treatment.

Oxyuris Vermicularis (Thread-worm or Pin-worm).—Thread-worms are of more frequent occurrence in city children than are either round-worms or tape-worms. The thread-worms have their habitat in the lower portion of the colon, where they become attached to the mucosa, and occasionally produce considerable catarrhal inflammation. The oxyuris is an insignificant looking object, light in color, from ¼ to ½ inch in length, and of the diameter of a pin. The ova are not so large as those of the ascaris. Raw fruit and uncooked vegetables may convey the infection.

Symptoms.—The worms produce an irritation and itching about, and a pricking sensation within, the anus. The discomfort is bitterly complained of after the child is in bed at night, the parasites being particularly active at this time. If there is any doubt as to their presence, the patient should receive a full dose of castor-oil—at least two teaspoonfuls. The discharges should be kept for inspection. If the parasites are present, they will usually be found embedded in a

considerable quantity of mucus, in the form of pieces resembling white thread, from ¼ to ⅛ inch in length.

Treatment.—Santonin, recommended by some writers as of service in these cases, has been without the slightest value in my hands. In fact, the use of drugs of any kind seems to be of very little value. After the third year turpentine in one-drop doses after meals is probably the most valuable form of internal medication. It may be given in emulsion or dropped upon sugar.

Rectal Injections.—Local treatment with the infusions of garlic or quassia is our principal reliance in the management of the obstinate cases. In patients in whom the worms have existed for a considerable time the resulting irritation causes a profuse secretion of mucus in the descending colon and sigmoid. This mucus must be washed out before any direct treatment can be effective. The colon should first be irrigated with a solution of one tablespoonful of borax to a pint of water. For this purpose a No. 18 American catheter should be used, as in colon flushings. The tube should be introduced for at least 10 inches. The child should be encouraged to bear down and expel the water alongside the tube, no attempt being made to have the solution retained. After the preliminary washing is complete, eight ounces of the infusion of quassia may be passed into the colon. To facilitate retention of the fluid the tube must be quickly withdrawn. The child may then be placed on the left side, with the buttocks elevated on a pillow. This position, or at least the recumbent position, should be maintained for one half-hour after the injection is given. A solution of the bichlorid of mercury 1:10,000 may be used in the same way. For ordinary family use, however, I consider either the garlic or the quassia much safer and equally effective. Garlic used in infusion identical with quassia is particularly effective, but its very disagreeable odor makes its use objectionable in many households, and therefore I advise it only when other means fail. After the worms and all evidences of their presence disappear, the treatment should be continued for a time on alternate days, and then twice a week, gradually reducing the frequency of the irrigations until they are no longer required. Few cases recover in less than four weeks, and in many it will be found necessary to continue the treatment for months. I have never seen a case, however, which did not eventually respond to persistent treatment.

Tenia or Tape-worm.—The tape-worm is a long, flattened organism, consisting of a head or scolex and hundreds of individual proglottides or offshoots derived from the head. Each segment in the series contains a large number of eggs. After the discharge of the segments from the body these ova are ingested and undergo a period of development in the tissues of an intermediate host, eventually forming the cysticerci or encapsulated bladder-worms which give the "measle" appearance to infected meat. This meat, when insufficiently cooked, conveys the cysticercus to the stomach of the patient, where the digestive juices liberate from the cyst-wall a head which is capable of becoming

attached to the mucosa of the child's alimentary tract and producing a mature parasite.

The chief varieties of tape-worm are the Tænia saginata, or beef-worm, the Tænia solium, or pork-worm, the Bothriocephalus latus, an inhabitant of fish, and the Tænia elliptica, which passes an intermediate stage in the vermin of household pets.

The Tænia saginata attains a length of from 12 to 20 feet. The head is from 1 to 2 mm. in diameter, and contains four suckers, but no hooklets.

The Tænia solium is rarely over 12 feet long. The offshoots from the median canal forming the uterus of a segment show less branching than in the case of Tænia saginata, and the developed segments in Tænia solium are more nearly square. The head has a short rostellum with a circle of hooklets.

The Bothriocephalus latus is far more common in northern Europe than in America. When mature, this worm is over 25 feet long. The segments are unusually broad, and the head is oval in outline and contains two lateral grooves.

Tænia elliptica occurs occasionally in very young infants. It is only 6 to 12 inches in length, and its segments are long and narrow.

Symptoms.—The tape-worm may produce symptoms of disturbed intestinal digestion, such as colicky pain and diarrhea. Usually, however, the first warning that the child is affected is afforded by the passage of segments of the worm.

A worm 14 feet in length was expelled, after treatment, by a little girl four years old. There had never been a symptom of its presence other than the passage of several of the segments.

A child, eighteen months of age, under my care, has passed 18 feet of a tape-worm without dislodging the head.

Treatment.—At bedtime, ½ ounce to 1 ounce of castor oil is given. Early next morning, two hours before breakfast, ½ dram of the oleoresin of male-fern (aspidium), in emulsion or in capsule, is given. During the day a light fluid diet only is allowed, such as broth, gruel, and fruit-juices. One treatment with a good preparation of the male-fern will usually bring away the worm entire. The head should be carefully searched for with the magnifying-glass. If the head is not found, the treatment should be repeated after an interval of twenty-four hours.

Uncinaria; Hook-worm.—The two forms of this parasite, *Ankylostoma duodenale* and *Uncinaria americana*, exhibit certain morphologic differences, the most marked of which is the existence, in ankylostoma, of two pairs of ventral, hook-like teeth, which are not present in the American species. The hook-worm measures from ¼ to ¾ inch in length. The ova, in large numbers, are present in the feces, and may be recognized as small oval bodies, usually clear in appearance, about 50 μ x 30 μ in size, showing various stages of segmentation. After the administration of thymol, followed by a saline cathartic, the worms themselves may appear in the stools as small objects, a little

thicker than a pin, about ½ inch long, and with the characteristic, retroverted hooked end.

The hook-worm has been known for many generations, but only during the past ten years has uncinariasis received due attention. In certain localities—notably the West Indies and the Southern States—the soil is very generally infected, and a considerable proportion of the population harbor the parasites. These not only remove blood from the circulation of the victim, but elaborate a toxin which is thought to assist in the causation of the significant anemia of this disease. Infection usually takes place from the soil, through the skin of bare feet. Infection may also take place through the skin of the hands, or by means of the gastro-intestinal tract, through the use of raw fruit or vegetables.

Symptoms.—The symptoms are those of digestive disturbance combined with progressive anemia. Abdominal discomfort of considerable degree may exist and this possibly gives rise to the curious habit of earth-eating, which these patients may acquire in their desire for the relief which the ingestion of food usually affords. As the disease progresses the face and ankles may become edematous. The stools contain occult blood. Lassitude and incapacity for sustained effort are prominent symptoms, and unless the cause of the disease is eliminated, the child falls behind in physical and mental development.

Treatment.—Thymol is specific for the hook-worm. A purgative should precede the administration of the drug. Twelve hours before administering the thymol a full dose of castor oil or cascara sagrada should be given. The thymol should then be given in solid form, 5 to 10 grains every three hours until four doses have been given. The drug is best given in capsules or pills. Twelve hours after the last dose, a cathartic should again be administered. Ten days after the administration of the thymol the stools should again be examined for the ova of the parasite, and if ova are found, the treatment should be repeated. Thymol poisoning is indicated by dizziness and discoloration of the urine. When these symptoms appear, the treatment should be discontinued and further purgation brought into use. During the active treatment the diet should consist of milk, broths, and gruels.

The anemia and malnutrition should be managed along the lines suggested under the respective headings.

Trichiniasis is a disease which children may occasionally acquire from the eating of uncooked ham, sausage, or pork. In localities where meat inspection is rigid, cases of this infection are relatively rare. The Trichina spiralis (Trichenella spiralis) is not infrequently found in hogs. The female parasite deposits larvæ in the submucosa, whence they are carried by the lymphatics to the blood-stream, and on reaching the voluntary muscles, become encapsulated. When the uncooked, infected meat is eaten, the capsules undergo dissolution, and the contained trichinæ are liberated in the digestive tract of the patient. These forms attain full development in the small intestine, and about a week after the ingestion of the meat set free a new brood of embryos.

Symptoms.—The severe symptoms of trichiniasis develop about ten days after the eating of the infected meat, frequently following a period of preliminary gastro-intestinal disturbance. When well advanced, the disease may be mistaken for typhoid, malaria, influenza, or acute rheumatism. Fever of a remittent type, great muscular pain and soreness, and edema of the face and eyelids suggestive of nephritis are the more pronounced effects. The blood shows not only leukocytosis, but a marked grade of eosinophilia. The symptoms usually subside after a week or ten days. Romanowitch has shown that in traversing the intestinal mucosa the trichina deposits bacteria which may distribute secondary infections. How important this fact may be in the explanation of symptoms occurring in this disease remains to be determined. In doubtful cases trichiniasis may be diagnosed by the microscopic demonstration of the encapsulated parasites in a bit of muscle tissue removed under local anesthesia from the deltoid, biceps, or gastrocnemius of the patient.

Illustrative Case.—A girl eight years of age consulted me because of muscle soreness, edema of the skin, and especially marked swelling and stiffness of the muscles of the left leg. Trichiniasis was suspected, and a small portion of the deltoid was removed, which showed the encapsulated parasite.

Treatment.—At the outset of the disease thorough catharsis is of unquestionable value, for it has been estimated that "each female parasite removed from the intestine means a reduction of the muscular infection by from 1500 to several thousand worms."* Calomel is undoubtedly indicated for this purpose, and this drug should be given in doses aggregating 1 to 2 grains, accompanied by 10 to 20 grains of bicarbonate of soda, and followed after six hours by a saline cathartic. Thymol may be given in the manner suggested under treatment of uncinariasis, but the position of the parasites deep in the intestinal mucosa renders most of them secure from the action of an anthelmintic. After the disease has become established, the treatment is solely symptomatic, consisting in the use of means to relieve pain, control temperature, and support the pulse, which in severe infections may become weak.

APPENDICITIS

The Appendix.†—This organ, normally, is located in the right iliac fossa, subjacent to McBurney's point, which marks the junction of the two lower thirds of a line connecting the right anterior superior iliac spine with the umbilicus. This position is attained as the result of intra-uterine changes in the intestinal canal, involving a gradual migration of the ileocolic junction from a primary position in the left iliac fossa upward to the right, beneath the liver, and finally downward into the right iliac fossa. When these changes are not completed, the organ will not be found in its normal adult location, but

* C. W. Stiles: Osler's Modern Medicine, vol. i.

† *Vide:* "Anatomy and Physiology of the Appendix," by Dr. Andrew McCosh, in "American Practice of Surgery," Bryant and Buck, vol. vii, p. 618 et seq.

frequently higher up. Because of variations in development the appendix may or may not have its origin from the extreme lower portion of the cecum. The lumen of the appendix at its base is, moreover, often very minute. Both of these facts partially explain the liability to inflammation. The total diameter of the organ is about ¼ inch, and the length, which is extremely variable, is usually between 2 and 3 inches. Various abnormalities in shape and direction occur, chiefly as a result of peritoneal adhesions.

The appendix contains serous, muscular, submucous, and mucous layers. It is, however, essentially a lymphoid structure, well deserving the name "abdominal tonsil." Like the tonsil, it attains its maximum development early in life, and, with the occurrence of the atrophic changes common in later years, shows a diminished susceptibility to infection.

Appendicitis is not so rare a disease of early childhood as is usually taught. It occurs with sufficient frequency for the practitioner not to forget the possibilities of its unexpected development.

I am confident that both acute and chronic cases are often overlooked because of the difficulty in diagnosis. In describing appendicitis, writers are inclined to divide the disease into types such as catarrhal, suppurative, gangrenous, and perforative. Such division is hardly possible. Because of the excess of lymphoid tissue in the child's appendix, the pathogenic process may be extremely active, and a case that is catarrhal today may be gangrenous tomorrow. Not all catarrhal cases go on to the later stages. Nevertheless, it must always be remembered that appendicitis in the child is usually a much more active disease than in the adult.

Age.—No age appears to be exempt. My youngest patient was nine months of age. Shaw reported the case of a patient seven weeks of age. My own cases have been in children ranging from nine months to fourteen years.

Symptoms.—That many errors are made in the diagnosis of appendicitis in infants and young children is beyond doubt for the reason that the cardinal symptoms, as laid down by writers, viz., vomiting, colic, and sensitiveness to pressure, do not complete the symptomatology. Pain is a relative term, and the complaint of pain, while it must be respected, is never to be relied upon. Some children will exaggerate the sensitiveness of the abdomen to pressure, and others will deny the existence of pain actually present. Vomiting and colic are very unreliable signs. Fortunately in children one sign is invariably present unless there is a malformed or misplaced appendix, which is most unusual. The sign of real value indicating an involved appendix in a child is *localized muscle rigidity—a spastic right rectus.* This symptom is entirely beyond the child's control, and while young children may be difficult to approach, patience in gaining the child's confidence, combined with attempts at diversion, will make a satisfactory examination possible.

Deep pressure is not necessary. If both recti are persistently

rigid, as I have seen in a few cases, the fact in no way disproves the presence of a diseased appendix. The signs usually given—vomiting, pain, and colic—are corroborative when there is a spastic right rectus. Alone they are suggestive of appendicular disease in children, but not diagnostic.

With the rigidity and unusual sensitiveness to deep pressure, there is a tendency to flexion of the thigh on the abdomen, to relieve the tension of the abdominal muscles.

Atypical cases may be seen, and in my experience have always been due to an abnormally long appendix. Thus, in the case of a boy of twelve years, the appendix was 6 inches long and the abscess was located in the tip, which was in the right hypochondrium. In this case there was general muscle rigidity.

In an eight-year-old child the diseased appendix was situated deeply in the pelvis. There was no pain or rigidity. Appendicitis was not diagnosed until rupture occurred and an acute localized peritonitis developed.

In another child, with a very long appendix, the local symptoms were all referred to the left side. Operation was delayed, through no fault of mine, until abscess and peritonitis developed. The tip of the gangrenous appendix was located two inches to the left of the median line.

Leukocytosis.—A leukocytosis has been present in all my cases in which a count was made, the differential count showing 70 per cent. or over of polymorphonuclear cells.

Exploratory Incision.—After a considerable experience with obscure acute and chronic abdominal conditions in children I have learned that an exploratory incision should be made as soon as we realize we are not positive regarding the character of the trouble at hand. This has been learned through experiences which I regret.

Prognosis.—The prognosis depends upon the ability of the physician to diagnose the disease, his courage to act promptly, and the good sense of the family. In the young, appendicitis is usually of the fulminating type, and while temporizing may answer in the adult, it may be fatal in the child. Statistics of high mortality mean defective management. In children over two years of age the results should be as favorable as in adults. If one uses ice-bags, stupes, and salines for three or four days and then operates, there will be a large mortality.

Diagnosis.—The chief diagnostic symptom is rigidity of the abdominal muscles, usually localized in the right side, sometimes general. I have seen marked general rigidity in a girl eleven years of age, in whom the appendix had not perforated. This symptom, with localized tenderness and the presence of a tumor, is to be looked upon as an independent diagnostic sign. All other symptoms to which much importance is attached are only of corroborative value.

Differential Diagnosis.—In cases of intussusception and periodic vomiting there is no muscle rigidity, and in periodic vomiting, no localized tenderness.

Acute peritonitis may simulate a later stage of atypical appendicitis so closely that a differential diagnosis is impossible without an exploratory incision. This should always be done in either event, whether there is a pyogenic peritonitis or peritonitis due to intussusception.

Acute pneumonia at the right base, with pleurisy, may produce signs closely simulating appendicitis, and is one of the conditions that may produce a spasm of the right rectus.

With pneumonia and pleurisy there are the unmistakable physical signs, the respiratory grunt, high temperature, and usually cough, together with the objective sign of rapid breathing—signs ordinarily sufficient to eliminate an error in diagnosis.

Treatment.—The treatment of proved acute appendicitis in children demands operation as early as possible. For the borderland case, with mild symptoms in which a positive diagnosis is not possible, rest in bed, a fluid diet without milk, and the ice-bag comprise the essentials in a scheme of treatment which may suffice. The recumbent position and quiet should be maintained until every sign of the trouble has disappeared.

Interval Operation.—In the event of the child's recovering from a well-defined attack without operation a suitable time should be selected for an interval operation. A second attack is very liable to follow in less than a year, with a strong probability of abscess formation. Furthermore, we cannot time the subsequent attacks, and these may occur with great severity when the child is otherwise ill or away from home where necessary surgical skill may not be obtainable.

CHRONIC APPENDICITIS

Chronic appendicitis has a very decided entity. It occurs in older children. I have never seen a case before the fourth year. In pediatric consultation practice it is not unusual to find the condition after this period.

Symptoms.—The cases usually show one of two groups of symptoms. Few cases show symptoms of both types.

A child in apparent health has complained of frequent abdominal pain over a period of several months. If asked to place his hand over the painful area, he will almost always place it over the umbilicus. There is no apparent sensitiveness over the appendix, no pain on deep pressure, and no rigidity of the recti. The pain is rarely severe and may occur at considerable intervals. In some cases the abdomen will never feel quite comfortable. There may be diarrhea alternating with constipation, or the stool may be perfectly normal and regular. In others unwarranted attacks of acute intestinal indigestion may occur, the occasion of which will not be explained by the habits of the patient.

The other type of case shows periodic, acute manifestations. These include vomiting, fever, and colicky pains, with diarrhea. There may be two or more attacks during the year. As in the cases of the first type, there may be no localization of signs in the abdomen.

Comby believes that many cases of cyclic vomiting have their

origin in chronic appendicitis, and he claims to have cured a considerable number of such cases by removal of the appendix.

Treatment.—Suspicious cases should be given an anesthetic after fasting for twelve hours, and then examined by deep palpation and through the rectum. If tumefaction is found in the right iliac fossa, operation for the removal of the appendix should be performed at the convenience of the patient.

A badly diseased appendix, as large as an adult index-finger, was recently removed from such a patient in whom there had been no localized symptoms other than a feeling of pressure or weight in the right side, but who always had, as he expressed it, an uncomfortable abdomen.

ACUTE GENERAL PERITONITIS

Acute general suppurative peritonitis is an infection of the peritoneum by pathogenic organisms. It is always a secondary disease, and its bacteriologic factor is that of the primary lesion. Thus, peritonitis may follow umbilical infection in the newly born, usually due to the streptococcus or to the staphylococcus aureus. It may be one of the lesions resulting from a general blood infection with the pneumococcus, the influenza bacillus, or streptococcus, whether the point of entrance be the upper respiratory tract or a surgical wound. Peritonitis may follow appendicitis, enterocolitis, or intestinal obstruction, and is then most often due to Bacillus coli communis, with or without the streptococcus. It may be due to the gonococcus, as the result of the progressive spread of vulvovaginitis, endometritis, and salpingitis in little girls. It may be due to the Bacillus typhosus in the course of typhoid fever. Finally, peritonitis may result from the extension of a pleural inflammation by means of the lymphatics, but the inflammation is then more often localized about the spleen or liver than generalized.

The pneumococcus probably is the pathogenic agent in more than half the cases.

PERITONITIS AS A COMPLICATION

The disease as a complication is not infrequent. I have seen cases with scarlet fever, with enterocolitis, with appendicitis, with endocarditis, and with pneumonia.

Pathology.—The exact character of the inflammation depends upon the infecting organism. The process, however, uniformly involves congestion, exudation of serum and lymph, and the formation of adhesions. Depending on the source and degree of infection, peritonitis may be localized, spreading or general, and serous, seropurulent, purulent, or fibrinous. The most frequent infecting agents are the colon and the typhoid bacillus and the streptococcus, staphylococcus, pneumococcus, and gonococcus. In cases of streptococcus-peritonitis the fluid is thin and widely diffused, and in pneumococcus infections, thick, greenish-yellow, purulent, and associated with fibrinous deposits and many adhesions. Gonococcal peritonitis is seldom diffuse. Pus with a characteristic fecal odor is suggestive of appendical or intestinal perforation. When the peritonitis is of limited extent, the

most common sites for the localization of the inflammation are the iliac fossa, pelvis, and subdiaphragmatic regions. Abscesses occasionally perforate spontaneously at the umbilicus. When recovery ensues, the peritoneum frequently becomes the seat of permanent adhesions which may or may not occasion symptoms.

Symptoms.—There are but three diagnostic symptoms of value: persistent vomiting, marked tympanites, and obstinate (and often absolute) constipation. These manifestations comprise a symptom-complex that is always present in acute peritonitis.

The temperature is usually persistently high—103° to 105° F. The pulse is small, soft, and quick, and the child appears and is very ill. The respiration is short and rapid; there is incomplete expansion. There are no evidences of pain except upon manipulation. The onset of all symptoms is usually, but not invariably, abrupt. It may be two or three days before the symptom-complex as described is present.

Duration and Prognosis.—Death rarely occurs before the third day, and the cases that pass ten days are rare. I have never known a case to recover. My cases have all been in children under two years of age, with two exceptions. One was a child of three with a streptococcus infection occurring with endocarditis. The other patient, a strong, vigorous girl, three years of age, developed a moderately severe enterocolitis. Response to treatment was fairly prompt, and in ten days the child was convalescent. Suddenly she developed marked distention of the abdomen, persistent vomiting, and obstinate constipation. These symptoms, with gradually increasing prostration, continued for three days, when the child died. The autopsy showed an acute general streptococcic peritonitis. Streptococcus was found in the enlarged mesenteric glands, proving that the intestinal tract was the source of the infection. The prognosis in older children after the fifth year is said to be more favorable.

Differential Diagnosis.—The only condition which the foregoing may simulate in infants and runabouts is intestinal obstruction, particularly that due to intussusception. Intussusception in a large majority of the cases occurs in infants under a year of age. Further, in intussusception there is no associated illness, and fever, if present, is insignificant; while the stools almost always contain blood-stained mucus or clear white mucus. I am convinced that every case of acute peritonitis in a young subject should have the benefit of an exploratory incision. There is always a possibility in obscure cases (and most cases are obscure) that the trouble is of appendicular origin or that there may be some other localized process which drainage might relieve. Acute general peritonitis is a very fatal disease, and the outlook cannot be made worse by incision and drainage.

Treatment.—Obviously, it would be unsatisfactory to the reader to have the treatment of a disease outlined by one who has never seen a recovery from the disease in question. My practice is to call a surgeon, who usually refuses to operate. An exploratory incision does not remove any of the chances of recovery, and there is always the hope that drainage may be of value.

VI. THE RECTUM AND ANUS

THE RECTUM IN CHILDREN

In the child, the division between the pelvis and abdominal cavities is less marked than in the adult, and the rectum is less distinctly a pelvic organ. The infantile pelvis, moreover, is peculiarly narrow, so that the course of the terminal portion of the intestine is nearly perpendicular. This peculiarity, combined with the greater mobility of the child's rectum, renders digital examination per rectum of great value in palpating diseased organs within the abdomen. The same anatomic conditions, associated with weakness of the levatores ani, are influential in the causation of prolapsus recti in children.

PROLAPSE OF THE ANUS AND RECTUM

In anal prolapse there is an eversion of the mucous membrane, a condition often presented in constipation and sometimes seen in diarrheal conditions of the dysenteric type, in which there is a tendency to considerable tenesmus and straining. If the case is neglected, the prolapse occurring repeatedly for many days in succession in cases of constipation, or several times a day in the acute diarrheal cases, the sphincter gradually becomes weakened, the prolapse more pronounced, and soon a considerable portion of the involuted rectum appears with each defecation. (See Fig. 21.) Such children usually show evidence of illness apart from the local condition and the constipation. They are usually underfed and poorly nourished. Many are rachitic, or show the ear-marks of a previous rachitic state.

Fig. 21.—Prolapse of rectum and anus.

Treatment.—Cases of simple eversion are usually relieved by controlling the diarrhea; or, when due to constipation, by supporting the perineum during defecation. This support is best furnished by wrapping a considerable quantity of absorbent cotton around the index-finger, which rests against and supports the perineum. The child should lie on the back during defecation. The troublesome cases are those due to constipation in "runabout" children, in whom the prolapse has been repeated every day for several months. The case represented in Fig. 22 was brought to the New York Polyclinic in the condition shown in the cut, and was transferred to the service of Dr. Wm. Seaman Bainbridge. The gut was practically black, and its condition

raised the question whether there was not sufficient strangulation, even if reduced, to cause death. Hot applications were placed upon the gut, and it was gradually reduced, but prolapse immediately followed. In order to keep the gut in position a long rubber tube of large caliber was inserted into the rectum and passed into the gut as high as possible. The

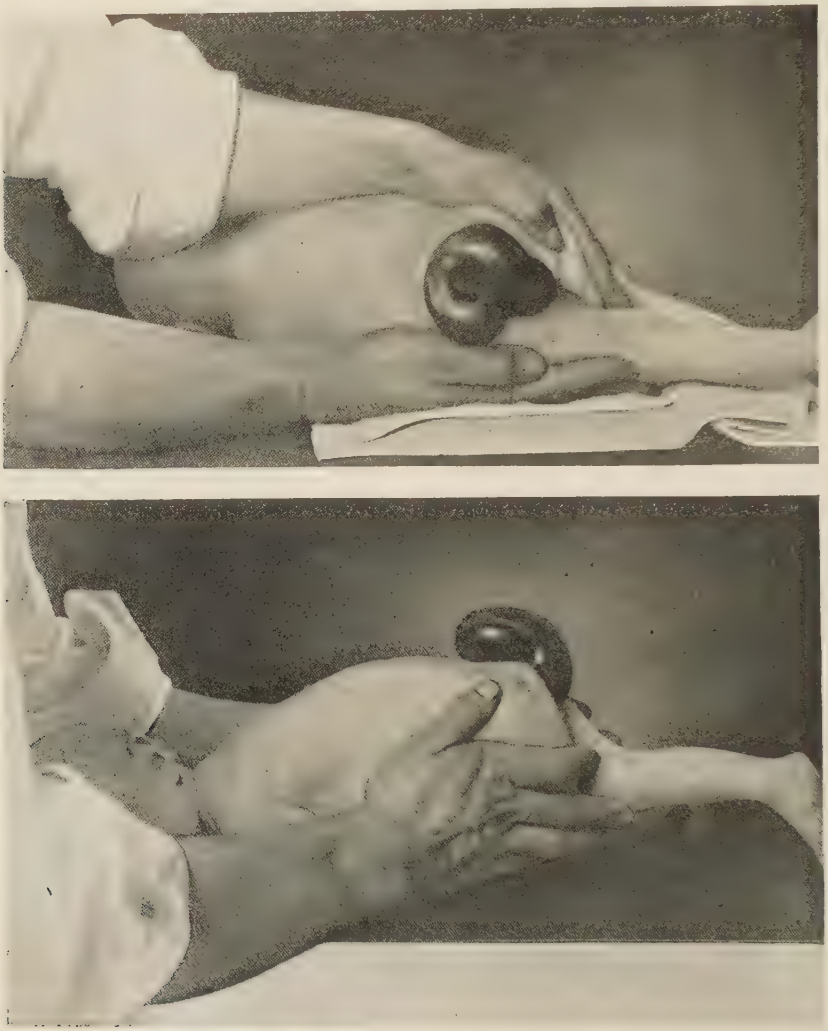


Fig. 22.—Involution of the rectum, sigmoid, and a portion of the descending colon.

rectum was then sewed tightly around the tube, anchoring the rectal outlet to the tube by a double purse-string of strong silk. The bowels moved through the tube, and for days there was great improvement. The use of the long tube held up the gut. Later the child died of pneumonia, but it was possible to remove the tube and then prolapse did not take place.

INFLAMMATION OF THE ANUS

An acute painful inflammation of the anus and of the skin surrounding it is frequently seen in children after a diarrhea of some days' duration. It is also seen in weakly, delicate children without any marked intestinal disturbance. The inflammation produces considerable distress during the passage of a stool, and is conducive to constipation, because the child soon dreads to have a bowel movement and tries to avoid it.

Treatment.—The child's nutrition and management in general must first be carefully looked after, as elsewhere suggested (p. 96). For the local trouble, the free use of warm water after each defecation is necessary. This is to be followed by a generous application of an ointment made as follows:

℞ Ichthyolis ..... ℥j
Unguenti aquæ rosæ ..... ℥j

Instructions are given that the parts are to be kept covered with the ointment, applied on a piece of old linen, which should be changed every three hours. This treatment is usually followed by prompt relief.

FISSURE OF THE ANUS

Anal fissure is a condition that usually occurs in quite young children. I have seen comparatively few cases in those over two years of age. Rough manipulation may be a cause, as in the case of unskilled use of the syringe or rectal tube. I have seen one such case. With very few exceptions, however, the fissure is due to the stretching of the parts by the passage of large fecal masses, which cause minute lacerations of the mucous membrane within the anal ring. Under a good light, gentle separation of the buttocks will usually bring the laceration into view.

Symptoms.—There are few more painful affections. The vigorous crying preceding and during the defecations aids the mother in locating the source of the child's trouble. Occasionally the fecal mass will be streaked with blood. The constipation which causes the trouble is aggravated by the painful nature of the condition, as the child soon learns to dread an evacuation, and postpones the act until medication or some manipulative means is employed to induce a movement.

Illustrative Case.—A little girl, twenty months old, was brought to me because she cried and objected to being placed in position for a bowel evacuation, and cried even more during the evacuation. On the day preceding the visit to my office the mother feared the child would have a convulsion, so great was her distress. Examination of the rectum showed two rather small fissures extending through the anal mucous membrane.

Treatment.—*Diet.*—For a prompt repair of the fissures it is necessary to render the stools soft. This, in the bottle-fed, is often easily accomplished by the addition, to each feeding, of one or two teaspoonfuls of one of the malted foods, such as Mellin's food or malted

milk. In other instances one feeding of malted milk each day may be substituted for one of the regular feedings, in the strength of 4 to 6 teaspoonfuls in 8 ounces of water.

Drugs.—If drugs are necessary or are preferred, the addition of 2 teaspoonfuls daily of the milk of magnesia to the milk food will prove of value. A teaspoonful of sweet oil after two or more feedings will likewise usually have the desired softening effect upon the stool.

Local Measures.—Proper regulation of the bowel function, while absolutely necessary for a cure of the laceration, is not of itself sufficient to effect permanent relief. The parts must be thoroughly washed with warm water and Castile soap after each defecation. After the washing, and at three-hour intervals during the day, 25 per cent. of ichthyol-ammonium-sulphate in zinc ointment should be applied with a clean index-finger, which is introduced well up into the anal aperture. If the fissure is deep, the treatment should be begun by cocainizing the parts with a 3 per cent. solution of cocain. The fissure may then be cauterized with a 50 per cent. solution of nitrate of silver, applied on a cotton-tipped probe. Twelve hours later the ichthyol ointment may be used as in the milder cases. I have yet to see a case which does not respond to the above treatment if it is faithfully carried out.

PROCTITIS

Inflammations of the rectum are of three different forms—catarrhal, croupous or membranous, and ulcerative.

Catarrhal proctitis is usually associated with a colitis higher in the bowel. When confined to the rectum, the process may be due to the careless use of irrigations or irritating suppositories, or the activity of thread-worms.

The mucous membrane is red and swollen, and exudes not only mucus, but a small amount of blood. In gonorrheal proctitis, which occasionally complicates a vulvovaginal infection by the same organism, the discharge from the inflamed parts is characteristically purulent.

Membranous proctitis may result from diphtheria of the genitals or from a local streptococcus-infection. The morbid lesions closely resemble those of membranous colitis, and are not essentially different from those which occur in membranous inflammations of the throat. The grayish, organized exudate may be visible on the mucosa of the prolapsed bowel, or appear in fragments in the stools.

Ulcerative proctitis is usually secondary to a severe catarrhal proctitis, in which case the lesions tend to remain superficial. Follicular ulcers of greater depth may occur in connection with follicular colitis. Syphilitic and tuberculous ulcerations of the rectum are rare. Holt reports one case of the tuberculous type, and records Steffen's observation of three others.

Symptoms.—In all forms of proctitis the movements of the bowels are frequent, and associated with tenesmus and the discharge of mucus and small amounts of blood. Prolapsus recti is not uncommon, and after reduction, shows a strong tendency to recur so long as the

severe peristaltic activity of the bowel persists. The character of the discharge is of value in differentiating the existing type of inflammation.

Treatment.—In mild cases of the catarrhal form injections of warm starch solution, alkaline liquid antiseptics, or sweet oil will effect a cure, provided the primary cause of the irritation has been removed. When the process is diphtheric, antitoxin should be promptly administered, as in cases of laryngeal diphtheria.

Ulcerative proctitis requires especial care involving the use of cleansing irrigations and suppositories of tannigen, belladonna, opium, or cocain, combined with local application, at intervals, of a solution of silver nitrate of 0.2 to 0.5 per cent. strength. For the gonorrheal cases Koplik advises rectal injections of 2 per cent. protargol solution, at a temperature of 105° to 108° F., twice daily.

ISCHIORECTAL ABSCESS

An abscess of this nature is the result of a preceding adenitis of the lymph-glands in the neighborhood of the rectum.

Symptoms.—The first sign will be that of pain on defecation or upon manipulation. Upon examination an oval, indurated mass will be found under the skin, usually not deeply placed. Much pain is evidenced during the examination. In most instances there will be redness of the skin over the involved gland. Rarely can fluctuation be made out by palpation. Suppuration, however, follows the primary infection very rapidly, and a distinct area of reddened and inflamed skin indicates the presence of pus beneath. Children's hospitals, children's asylums, and dispensary services supply the majority of these patients. Occasionally a case is seen in private work.

Treatment.—All that is required is a free incision, daily washing-out of the abscess cavity with a 3 per cent. solution of hydrogen peroxid, and packing with sterilized gauze moistened with a saturated solution of boric acid. A layer of gauze, covered with oiled silk, should cover the dressing, to protect the wound from further infection by the fecal discharges. In case the granulations are sluggish, as they may be in marasmic infants, the gauze used for the packing may be saturated with the balsam of Peru.

VII. THE SPLEEN AND THE LIVER

The Spleen

In children the spleen is very rarely the seat of primary disease. Sarcoma,carcinoma, abscess, and cysts, with primary involvement of the spleen, have been reported. This organ, however, frequently shows secondary involvement and furnishes an important diagnostic sign in a large number of diseases. Thus the spleen is enlarged in syphilis, in rachitis, typhoid fever, in persistent intestinal infections, in malaria, in cirrhosis of the liver, in right heart failure, and in practically all the blood diseases of early life.

Usually the organ shows a simple enlargement, which subsides when the disease causing the condition is removed. As the result of repeated or persistent enlargement for a considerable time, as in malaria and some of the blood disorders, it undergoes hyperplasia and permanent enlargement.

SPLENOMEGALY

Primary splenomegaly of the Gaucher type is of unknown origin. The probable cause is a chronic toxic agent, to which a family predisposition exists.

Splenomegaly in infantile splenic anemia has been found to be associated with a parasite, *Leishmania infantum*, similar to the Leishman-Donovan parasite, which is the cause of kala-azar. The parasite was discovered in the infantile cases by Pianese and Nicolle.

Splenomegaly occurs in cases of septicemia, malaria, tuberculosis, syphilis, rachitis, leukemia, Hodgkin's disease, and anæmia infantum pseudoleukæmia. In pernicious anemia the spleen is rarely very large.

Neoplasms (sarcoma, angioma, fibroma, cysts) of the spleen are very rare.

Obstruction of the portal circulation may cause splenomegaly, as in cirrhosis of the liver, heart disease, or pressure from a new-growth.

The Liver

The liver in infants and children is very rarely a primary seat of disease. In the mortality of childhood as an immediate cause of fatal diseases the liver plays a very unimportant rôle.

Derangement of function, on the other hand, is unquestionably at the bottom of many disorders not at all understood at the present time.

The rheumatic complex (p. 687) will some day be demonstrated to be due to a persistently perverted function of the liver or deficient functions of the blood itself.

Fatty degeneration of the liver in early life is often found at autopsy. It is found in greater or less degree in practically all infants and young children who die from prolonged and exhausting diseases.

Presumably the infiltration is of a temporary nature, and, so far as is known, has no symptomatology of its own. In many cases that recover the liver must have undergone fatty changes. It is rare not to find more or less fatty changes at a postmortem examination of a child under one year of age. In some cases the involvement is so extensive that the entire organ is firm, smooth, and of a yellowish color. In other cases there are only localized evidences of the fatty process. Usually the organ is not enlarged. The condition is not to be diagnosed during life. If there is a derangement of function, this is not of such a nature as to make the actual hepatic conditions manifest.

Acute Yellow Atrophy.—Fatal cases of this disease in children are reported at rare intervals.

Abscess of the liver in the newly born is the result of an infection usually acquired from the umbilical veins. Several cases have been reported in literature, in which the abscess was caused by the migration of round-worms into the hepatic duct.

Abscess of the liver may result in any pyemic condition. Its rare occurrence demonstrates the hepatic powers of resistance against microbic invasion.

The Amœba coli has been the cause in a considerable number of cases.

Symptoms.—Enlargement of the organ, associated with the presence of marked tenderness, is usual. Pain is a very constant symptom, and may be referred to different points in the abdomen. Not infrequently it is felt at the umbilicus, or it may be localized between the right scapula and spine. Among the most prominent active manifestations are repeated chills, a widely ranging septic temperature, and vomiting. Occasionally there is diarrhea.

Exploration should be performed, and if pus is located, aspiration and drainage should follow. Abscesses not operated upon are apt to perforate into the peritoneal or pleural cavity. Cases of perforation into the intestine have been followed by recovery.

Cirrhosis of the Liver.—Cirrhosis of the liver belongs to the curiosities of pediatric practice. All the cases reported represent the observations of as many men.

In the reported cases in which there has been a supposed etiologic factor, syphilis, alcohol, and the infectious diseases have been looked upon as the agencies causing the disease.

Toxic substances of widely different character are apparently capable of causing cirrhosis of the liver in the young.

Symptoms.—At first there is enlargement of the liver and the spleen. Persistent but not severe icterus and ascites supervene. The patient shows early evidences of malnutrition, and a cachexia that is strongly suggestive of the underlying condition. As the case progresses the liver becomes very much reduced in size, diarrhea becomes fairly con-

stant, vomiting frequent, and dilatation of the superficial abdominal veins occurs. Bronchopneumonia is the usual terminal complication.

Treatment.—The management is entirely symptomatic. Tapping may temporarily relieve the embarrassed respiration and the general discomfort occasioned by the large amount of fluid in the abdominal cavity.

ICTERUS (OBSTRUCTIVE JAUNDICE; CATARRHAL JAUNDICE)

Jaundice of this type in children is usually associated with duodenitis, and is caused by a swelling of the lymphoid bodies in the mucous membrane of the common bile-duct at its terminal opening into the intestine. The jaundice is due probably to the same form of infection that caused the duodenitis. Cases often occur in groups of two or three in the same family. In November, 1911, three children and two adults—the mother and nurse—had pronounced jaundice with the usual manifestations. Six weeks before, all these people had suffered from malaria. I have seen but one case in which jaundice was due to cholelithiasis. This patient, a girl six years of age, had distinct attacks of biliary colic, accompanied by passage of gall-stones and followed by intense jaundice. She was eventually operated upon and many stones were removed from the gall-bladder.

Symptoms.—The onset of my cases has almost never been marked by high temperature or evidence of severe gastric disturbance. Usually the first signs have been loss of appetite, coated tongue, rise of a degree or two in temperature, and listlessness. The yellow discoloration of the conjunctiva and skin soon appears, and this, with the high-colored urine and slightly colored or grayish stools, makes the case complete.

The liver is usually enlarged an inch or two below the ribs, and often is slightly tender. The spleen is also slightly enlarged.

I have never known a fatal case, although such have been reported.

Vomiting.—In my most severe case the vomiting continued for five days, neither food nor water being retained. Vomiting is present in most cases. The child vomits two or three times, or at intervals for a day or two.

Treatment.—*Diet.*—The reason why gastric disorder is considered so prominent a symptom by many writers is possibly because of the gastric disturbance produced by the treatment. We are advised to place the patient on a milk diet and give calomel. I know of no treatment better calculated to produce vomiting and increase both the intestinal infection and the jaundice. The treatment which I have found most satisfactory is the use of very little food for twenty-four hours. Water is given as a drink, and later, well-salted chicken or mutton broth may be given with toast, if the child asks for food. He should not be urged to eat. The following day broths, gruels, and orange-juice, with stewed fruits or lemonade, are given if wanted.

Drugs.—The only medication used consists of rhubarb and soda. To a child five years of age I give 4 grains of pulverized rhubarb and 8 grains of bicarbonate of soda from two to three times daily, giving at

the same time considerable water. For a day or two sufficient medicine should be given to produce a free laxative effect, but not necessarily enough to purge the patient. Usually on the third day I begin with tincture of nux vomica and dilute hydrochloric acid—from 2 to 4 drops of each, well diluted. When the stools are again normal, the usual diet may be resumed, milk not being used for a week afterward. Rhubarb and soda are best given as follows:

℞ Pulveris rhei ..... gr. xlviij
Sodii bicarbonatis ..... gr. xcvj
Syrupi rhei aromatici ..... ℥j
Aquæ ..... q. s. ad ℥ij
M. Sig.—Shake well. One teaspoonful two or three times daily after meals.

VIII. DISEASES OF THE RESPIRATORY TRACT

The Nose and Throat

ACUTE RHINITIS (CORYZA; SNUFFLES; COLD IN THE HEAD)

Acute rhinitis is a very common ailment throughout childhood. Newly born babes, "runabouts," and school-children alike are sufferers.

Symptoms.—The onset is usually sudden, and characterized by sneezing and difficulty in breathing through the nose. This may continue for a few hours or, in some cases, for a day or two. At the expiration of this time a mucous, watery nasal discharge appears. Infants are the greatest sufferers, owing to the fact that breathing, which has to be carried on largely through the mouth, is rendered difficult, and nursing, in consequence, is frequently interrupted. A degree or two of fever may exist at the commencement of the attack, but any elevation of temperature, as a rule, lasts only a few hours. Neglected cases sometimes become infected with pyogenic bacteria (staphylococcus, pneumococcus, and streptococcus), in which event a troublesome purulent rhinitis results. In the majority of the neglected cases, and in some of those that are well treated, the rhinitis is the beginning of an infection of the mucous membrane, which involves successively the fauces, tonsils, larynx, and bronchi. Repeated attacks doubtless contribute to the production of adenoid growths in the nasopharyngeal vault.

Differential Diagnosis.—Acute simple rhinitis is to be differentiated from specific rhinitis, which is one of the first manifestations of congenital syphilis. When due to syphilitic infection, the condition is uninfluenced by the usual treatment. There is no tendency for it to descend and involve the mucous membrane of the bronchi. The hoarseness of congenital syphilis is persistent and of gradual development. Furthermore, if the rhinitis is due to syphilis, other diagnostic signs are present or will soon appear.

Measles almost invariably begins as an acute rhinitis. The accompanying conjunctivitis, the hard, dry, hacking cough, and the characteristic rash soon make the diagnosis possible. In nasal diphtheria there is invariably a discharge from the nose which may be differentiated from that of simple rhinitis by the fact that the discharge in diphtheria is excoriating in character and is often tinged with blood. A diphtheric discharge may be limited entirely to one nostril or may be greater from one nostril than the other; while in acute simple rhinitis the amount of the discharge is usually the same from both sides. Influenza begins with sneezing and nasal discharge, serous in character. In influenza, however, there will be associated cough, fever, and more or less prostration.

Duration.—The tendency of acute simple rhinitis in a strong child is toward recovery in five or six days. When the surroundings are unfavorable, or the child is delicate or rachitic, active treatment will be required to bring about a prompt recovery.

Complications.—Simple rhinitis is very often the beginning of an infection which may reach the middle ear and produce purulent otitis or mastoid disease. Cervical adenitis is not an infrequent outcome. Retropharyngeal adenitis and retropharyngeal abscess, acute laryngitis, bronchitis, and bronchopneumonia, may all result from acute rhinitis. Early treatment and care of the primary condition are, therefore, exceedingly important.

Treatment.—The first step is the administration of two teaspoonfuls of castor oil. During the initial stage of engorgement much may be accomplished for the very young by local medicaments. One of the best is menthol, ½ grain, dissolved in 1 ounce of liquid albolene. Of this solution 3 drops should be instilled into each nostril every hour by means of a medicine-dropper. This treatment alone will relieve the patient of distressing obstruction and facilitate freer breathing. Older children may use a spray containing 1 grain of menthol to 1 ounce of liquid albolene at intervals of two or three hours.

In case menthol and albolene are not at hand, melted white vaselin may be similarly employed.

For internal use the following medication has served me well:

At least six doses should be given in the twenty-four hours.

For a child three months of age:

℞ Tincturæ belladonnæ ..... gtt. vij
Pulveris camphoræ ..... gr. iv
Sacchari lactis, q. s.
M. div. et ft. tabellæ no. xxx.
Sig.—One tablet every two hours.

Six months of age:

℞ Tincturæ belladonnæ ..... gtt. x
Pulveris camphoræ ..... gr. v
Pulveris ipecacuanhæ et opii ..... gr. iv
Sacchari lactis, q. s.
M. div. et ft. tabellæ no. xxx.
Sig.—One every two hours in water.

From one to two years of age:

℞ Tincturæ belladonnæ ..... gtt. xv
Pulveris camphoræ ..... gr. vj
Pulveris ipecacuanhæ et opii ..... gr. x
M. div. et ft. tabellæ no. xxx.
Sig.—One every two hours.

From two to four years of age:

℞ Tincturæ belladonnæ ..... gtt. xv
Pulveris camphoræ ..... gr. vj
Pulveris ipecacuanhæ et opii ..... gr. xv
Sacchari lactis, q. s.
M. div. et ft. tabellæ no. xxx.
Sig.—One every two hours.

If for any reason the tablets cannot be prepared, powders will answer the purpose equally well.

The above prescriptions are indicated for the second or catarrhal stage, in which we usually find the patient on beginning treatment. We must guard against the constipating effects of the camphor and the Dover's powder.

In the treatment of nasal disorders the forcible use of the syringe, or any form of nasal irrigation which requires force, should be condemned. Infection is easily carried into the Eustachian tubes, and may give rise to very grave complications. A suppurative otitis is thus very easily produced.

An enema of warm sweet oil or soapsuds should be administered if the bowels do not move once in twenty-four hours. In treating children of a markedly constipated habit the Dover's powder may be omitted. Internal medication, if begun early and properly carried out, will not be needed for more than two or three days. During an attack of acute rhinitis the child should not be unnecessarily exposed to cold, owing to the strong tendency of the inflammation to descend and involve the deeper portions of the respiratory tract.

CHRONIC RHINITIS (NASAL CATARRH)

Nasal discharge, more or less constant, is present in not a few individuals throughout childhood. In the majority of those affected this discharge begins with the onset of cold weather and lasts until spring. The secretion may be composed of thin, watery mucus, or it may be mucopurulent in character.

Etiology.—In order to treat this condition successfully the source of the discharge must be discovered. It may be due to several causes, which are here given in the order of their frequency:

1. Adenoids in the nasopharyngeal vault.

2. Hypertrophy of the turbinated bones, with septal deviations and hypertrophy of the mucous membranes.

3. Infection due to pyogenic bacteria. When present, this may follow acute rhinitis, but is more often the sequel of one of the infectious diseases. The discharge may be distinctly purulent and is often very profuse.

4. Infection due to the Klebs-Löffler bacillus. I have seen a great many cases of this type in children under eight years of age, in whom a serous discharge from one or both nostrils has persisted for a considerable period of time—in one instance for an entire year. Examination of the discharge showed the presence of the Klebs-Löffler bacillus. Such children are not ill, and are brought to a physician solely for treatment of the nasal discharge. The cases do not clear up under ordinary methods of treatment, but promptly respond when from 1500 to 2000 units of diphtheria antitoxin is given.

5. Hay-fever is characterized by a periodic discharge which may be said to be chronic in character, persisting over several weeks.

6. Malnutrition. A thin, watery discharge, apparently due to

relaxed mucous membranes, occurs in weak and poorly nourished children with no other abnormal condition to explain the trouble than the general weakness.

7. Disease of the sinuses. Sinus infection of a mild type may cause persistent rhinitis without other symptoms, and these cavities should be examined in obscure cases.

8. Foreign bodies. A foreign body in either nostril will produce a persistent discharge. When a child is brought to me with a history of a persistent serous or purulent discharge from one nostril, I invariably examine for a foreign body, and repeatedly have found this discharge explained by the presence of a pea, a bean, a piece of coal, or a button. At the out-patient department of the Babies' Hospital a child three years of age was brought for treatment of a persistent right-sided nasal discharge which had existed for seven months. Examination showed a foreign body well up in the nostril. This object was removed with considerable difficulty and proved to be a piece of cork.

In these cases of chronic rhinitis the possibility of adenoids (see p. 290) should never be forgotten; for their existence cannot be excluded because a child is not a mouth-breather and does not snore. A child with a chronic "cold in the head" almost invariably has adenoid vegetations in the nasopharyngeal vault. Examination may reveal that the nasopharyngeal space is blocked by the growth, so that entrance with the finger is almost impossible. In other instances only a small, pulpy mass will be found, or a ridge, or soft, friable growth at the upper portion of the vault, not large enough to produce signs of obstruction, but actively secreting and manifestly the source of the discharge. Children who have anterior nasal defects, such as hypertrophies of bone or thickening of the membranes, usually have adenoids as well. In fact, adenoids play no small part in most of the catarrhal affections of the upper respiratory tract in children, and an examination of a child with a nasal discharge or a cough which is difficult to explain is never complete without an exploration of the nasopharyngeal vault.

Treatment.—The treatment consists in correcting the condition which causes the discharge. If adenoids are present in a sufficient amount to cause trouble, they should be removed (p. 296). No other treatment is of any avail. For deformities and hypertrophies of the anterior nasal structure operative measures are also essential, but should be carried out by one skilled in rhinoplastic work. Purulent rhinitis, primary or following the infectious diseases, is best treated by a spray composed of liquid albolene, 1 ounce, ichthyol ammonium sulphate, 2 grains, which should be thoroughly shaken before using. This spray should be used every two hours while the child is awake. Once or twice a day it may be well, if the secretion is profuse and purulent, to instil into the nostril about 20 minims of a 1:6 aqueous solution of hydrogen peroxid. If the Klebs-Löffler bacillus is present, antitoxin alone will control the disease, and that very promptly.

The anemic and poorly nourished patients, who show almost no abnormality, but suffer more or less from a constant serous discharge,

are benefited by constitutional measures only—a dry climate, plain, nourishing food, iron, cod-liver oil, massage, and salt baths. Suitable management is referred to in detail under The Management of Delicate Children (p. 134). Applied to these children, local treatment, apart from cleanliness, is a loss of time and energy.

NASAL HEMORRHAGE

Non-traumatic nasal hemorrhage in a child usually occurs from one of two sources—adenoid vegetations in the nasopharyngeal vault or an erosion or ulceration of the mucous membrane covering the free vascular area of the anterior portion of the nasal septum.

Treatment.—When the hemorrhage is due to an adenoid growth, it is usually readily controlled by keeping the child in an upright position, or by the application of cold to the back of the neck—preferably by a piece of ice wrapped in a table napkin or by an ice-bag. When the hemorrhage is due to an erosion of the septum and pressure of the finger on the outer side of the bleeding nostril is found ineffective, the nostril may be packed with cotton saturated with a 5 per cent. solution of antipyrin or a 1:2000 solution of adrenalin.

For permanent relief, and to prevent a recurrence of the hemorrhage, adenoids should be removed and an excoriated or ulcerated septum cauterized with a 50 per cent. solution of silver nitrate. If the ulcer is first cleaned with plain water, ordinarily but one or two applications of the silver solution will be required. Spraying the affected side with a 1 per cent. solution of ichthyol in liquid albolene will hasten the healing process. As the ichthyol is not soluble in the oil, the mixture should be well shaken before using.

THROAT EXAMINATION

In order to examine the throat of a young child quickly and thoroughly it is necessary that he be held in a proper position in front of and at the right side of the attendant, supported by her left arm beneath the buttocks. Her right arm, which is thus left free, is passed around the child, binding his arms to his sides (Fig. 23). The child's head rests against the shoulder of the attendant. The physician places his left hand on the child's head to steady it, and with the tongue-depressor or teaspoon in his right hand, with the child in perfect control, presses the tongue downward so that it will not obscure the field of vision. In handling an older and stronger child, it is best to bind the arms to the sides with a large towel or small sheet. The most satisfactory view can be obtained by daylight before a window. If the examination is made in the evening, a lamp or taper held by a third person, a little above and behind the attendant's right shoulder, will furnish satisfactory illumination. The head-mirror should be used for children who are too ill to be taken out of bed, the reflection from a lighted lamp or candle being sufficient.

PERSISTENT COUGH

I have had occasion to examine and treat many children who were brought to me because of a "cough" which had not been controlled by the measures employed. The history is usually only that of a persistent cough. This may be irritating in character, keeping the child awake at night, or it may be paroxysmal, the attacks being more severe when the child is lying down. Many times the paroxysms are so severe,

Fig. 23.—Examination of the throat.

particularly at night, that whooping-cough is suspected because of the absence of chest signs.

Types of Cough.—While we hear much of the cough of teething, the "stomach cough," the "nervous cough," and the "habit cough," it has never been my lot to see a case in which the cough was not connected in some way with the respiratory tract. Thorough examination of these cases, perhaps repeated examinations, will be required before the site of the trouble is definitely located, when it will invariably be

found somewhere between the anterior nares and the thorax. The "stomach cough," the "nervous cough," or the "teething cough" formerly stood for the persistent cough which could not be accounted for by physical examination of the chest or by mere inspection of the throat. They are frequently referred to by the older writers.

An adherent pleura and enlarged tonsils without adenoids are accountable for a very small number of these cases. An elongated uvula, to which these obscure coughs have also been attributed, is very rarely a cause.

Adenoid Vegetations.—An immense majority of these obscure coughs in children are due to adenoid vegetations, with or without enlarged tonsils. A child with such a cough may have the typical adenoid face, mouth-breathing, and other signs referred to (see Adenoids, page 290), or these symptoms may be entirely absent. It is the latter type of case that is particularly puzzling and apt to be overlooked. On account of the absence of mouth-breathing and other symptoms of nasal obstruction, the possibility of adenoid vegetations has been ignored. In these cases careful inquiry will usually elicit the history of frequent colds, or what is styled "catarrh" (as there is more or less serous discharge from the nose), or the statement that the child "takes cold in the head easily." Digital examination of the nasopharyngeal vault will reveal a fringe of soft adenoid growth at the upper portion of the posterior pharyngeal wall, not large enough to produce obstruction, but actively secreting. This secretion, if not profuse, is partially evaporated in the nostrils, or if profuse, is discharged from the nostrils or passes backward over the posterior pharyngeal wall, thus provoking cough, when the child is up and about. When the child rests on his back, the secretion naturally flows over the posterior pharyngeal wall, and induces cough. Time and again I have relieved the most obstinate cough by cureting and removing this sponge-like tissue.

Illustrative Case.—In the case of one patient, a boy two years of age, who had been coughing hard for ten days with paroxysms and vomiting, a diagnosis of pertussis had been made both by a member of the family who had seen many cases of whooping-cough, and also by myself. Adenoids were found to be present in a slight degree. Their removal was accomplished, with the idea of making the coughing attacks less severe, when, greatly to our surprise, the coughing ceased at once, not a paroxysm occurring after the growth was removed. The cough was due to the adenoid vegetations and not to pertussis.

Adherent Pleura.—Adherent pleura, non-tuberculous, as previously mentioned, is occasionally a cause of persistent cough. Autopsies upon children who have died with non-respiratory diseases often show these pleuritic adhesions, which are not suspected during life. A little girl twelve years of age was brought to me because of a persistent cough. The child was otherwise well and gaining in weight. She had been treated with expectorants, cod-liver oil, and the usual other medication, without avail. The cough remained unchanged and was influenced only by opiates. A very careful physical examination revealed friction râles, covering an area the size of a half-dollar, at the base of the right

lung, adjacent to the spine. They were heard only on forced inspiration and had been overlooked in the previous examination. The case had been diagnosed as one of "nervous cough."

Tracheal Cough.—Tracheitis will produce a severe and intractable cough, with no signs in the chest. These cases frequently follow attacks of true influenza, or the cough may be present during the active period of the disease. If the child is old enough, he will aid us by referring to the sense of discomfort and tightness, which exists over the upper portion of the chest. Sometimes the sensation will be described as a burning which is located directly over the trachea.

Tuberculosis.—Incipient tuberculous infiltration in any portion of the lungs or pleura may produce persistent cough. Thorough physical examinations and careful observation of all the cases, with the von Pirquet test, will make a diagnosis possible.

Pertussis.—Pertussis without the whoop or vomiting may cause a persistent cough. It runs its course and subsides in from four to eight weeks. A diagnosis is possible only when there is a history of exposure to the disease. The treatment of the various conditions producing cough is referred to under their respective headings.

FAUCITIS

By the term, faucitis, we understand an inflammation of that portion of the mucous membrane of the buccal cavity situated posteriorly to the soft palate and the anterior pillars of the fauces, including both the anterior and posterior pillars, the tonsils, and the pharyngeal vault. The inflammatory process is superficial, involving the mucous membrane only, so that the tonsils are involved only to the extent of the mucous membrane.

Faucitis is always present in scarlet fever, usually to a marked degree. In measles it is also present, but less intense in its manifestations. Its most frequent appearance is in connection with a summer cold. Every year, in late May and June, I am called upon to treat a great many such cases. The symptoms always comprise cough, which is dry and ineffective, and a slight fever—from 100° to 101° F. The child complains of sore throat, and has some discomfort on swallowing. Upon inspection, an intense inflammation will be noticed, involving the entire visible mucous membrane. In many cases the inflammation extends downward and involves the larynx, which fact will be indicated by the hoarse, croupy character of the cough. The condition is usually the result of a mixed infection, with the streptococcus predominant. The entire illness is ordinarily of three or four days' duration.

Treatment.—The condition is best relieved by a purgative of rhubarb and soda—3 grains of powdered rhubarb and 3 grains of soda for a child from two to five years of age. To a child under two years of age 1 to 3 grains of rhubarb and 1 to 2 grains of bicarbonate of soda may be given. This, in the case of a child from one to three years of age, is followed by a tablet or powder of tartar emetic, $\frac{1}{960}$ grain, powdered

ipecac, $\frac{1}{60}$ grain, and chlorate of potash, 1 grain, at two-hour intervals. Older children, three years and over, receive 2 to 3 grains of chlorate of potash, $\frac{1}{90}$ grain of tartar emetic, and $\frac{1}{4}\frac{1}{0}$ grain of ipecac at two-hour intervals—6 doses in twenty-four hours.

PHARYNGITIS

Inflammation limited to the posterior pharyngeal wall is of rather infrequent occurrence in young children. When thus affected, the parts present a reddened, granular appearance. In the cases which have come under my observation such a condition has always been associated with digestive disturbances. The tongue is usually coated, and the breath, foul. A dry cough and frequent attempts at clearing the throat are the usual symptoms. The temperature is rarely above 101° F. The condition is to be distinguished from the pharyngitis which occurs as a result of microbic infection, in that only the posterior wall is involved, the adjacent structures remaining unchanged. The tonsils and pillars of the fauces and the soft palate present a normal appearance.

Treatment.—The treatment is to reduce the diet for a few days to cereal gruels,—barley, rice, or wheat,—or to chicken or mutton broth. Calomel, $\frac{1}{10}$ grain, with 1 grain of rhubarb, given after feedings, three times a day for three days, will promptly relieve the condition.

RETROPHARYNGEAL ADENITIS

Retropharyngeal adenitis, as the name implies, is an inflammation of one or more of the glands situated posterior to the pharynx, between the pharyngeal and prevertebral muscles.

Symptoms.—Pain and difficulty in swallowing are always present. Other symptoms are fever—100° to 103° F.—and loss of appetite. The patient often holds the head toward the affected side, so as to relax the muscle tension caused by the tumor. If the adenitis is situated low down, disturbance of the voice (cracked voice) and respiratory obstruction may result.

Diagnosis.—In an acute case inspection of the throat will usually show a swelling at the right of the median line. If situated low down on the posterior pharyngeal wall, the adenitis may escape detection. Upon digital examination, instead of a smooth, flat surface, the finger encounters an elevated, rounded mass, which should not be mistaken for an unduly prominent cervical vertebra.

Prognosis.—The glands, as a rule, suppurate, forming a retropharyngeal abscess. (See p. 275.) This, however, does not invariably follow. In the case of a baby six months old we waited several days for the suppuration of the gland, which was greatly enlarged. This failed to occur, and the child recovered.

Treatment.—The treatment must be both local and constitutional. Local treatment consists in cleanliness. The mouth should be washed with a saturated solution of boric acid after each feeding. Iodids,

in treating adenitis in children, I have found of questionable service. More is accomplished by suitable diet and plenty of fresh air.

ACUTE RETROPHARYNGEAL ABSCESS

Acute retropharyngeal abscess is the result of a streptococcus-infection of one or more of the retropharyngeal lymph-nodes which form a chain on either side of the median line, posterior to the pharynx, and between the pharyngeal and the prevertebral muscles.

Location.—The abscess is most frequently situated to the right of the median line. It may be located high in the pharynx, so as to be plainly visible when the mouth is well opened, or it may be placed low, posterior to the larynx and upper trachea. Usually the abscess points anteriorly into the throat. It may point both externally and internally. In a large number of cases I have not seen one that pointed externally only.

Age of Patients.—Retropharyngeal abscess is preëminently a disease of infancy. The retropharyngeal lymph-nodes are said to disappear at the third year. I have not seen a case in a child over three years of age.

Etiology.—Any active infection of the throat may cause the disease. It may occur without our knowledge of any infectious process having been present. All throats continually harbor pathogenic bacteria, which may infect the retropharyngeal lymph-nodes.

It has not been my observation that retropharyngeal abscess is a common sequel of diphtheria and the exanthemata.

Symptoms.—I agree with Morse and others who state that these cases are usually overlooked—erroneously diagnosed. They are frequently diagnosed as cases of adenoids, and the removal operation is advised. It is a mistake to lay down too definite a symptomatology of a condition that lends itself to widely varying symptoms. In describing the disease writers tell us that the patient holds the head in a characteristic position,—backward and toward the affected side,—that the breathing is noisy and stertorous in character, that there is difficulty in swallowing, that there are enlarged lymph-glands at the angle of the jaw, that there is usually a high fever, and that a bulging of one side of the posterior pharyngeal wall is usually visible. It is exceedingly rare to find this combination of symptoms. There are two diagnostic symptoms that are present in all cases—difficulty in swallowing and a persistently changed voice—a so-called cracked, high-pitched voice. These symptoms should lead one to suspect retropharyngeal adenitis or abscess, and the finger examination determines which condition is present. If adenitis exists, a rounded, hard tumor will be felt; if an abscess has formed, a soft, fluctuating tumor will be detected. This may be placed so high in the pharyngeal vault as to be plainly seen through a wide-open mouth, or it may be low and out of sight in ordinary examination. There is a variation of at least two inches in the possible location of the abscess, and this fact accounts for the varying symptomatology. The difficulty in swallowing interferes

greatly with nursing, and should always lead the physician not only to inspection, but also to digital examination of the throat.

Illustrative Cases.—A baby nine months of age had been under treatment in one of the outdoor clinics of New York city. A diagnosis of adenoids had been made and a day appointed for the operation. The mother, wishing to have the diagnosis of adenoids confirmed, brought the child to the Babies' Hospital. The symptoms of mouth-breathing, nasal voice, and slight difficulty in swallowing had been present for a couple of weeks. There was no characteristic position of the head, no rigidity of the neck, no superficial enlargement of the lymphatic glands. Inspection of the throat disclosed a bulging forward of the soft palate on the right side. A digital examination revealed a round, fluctuating mass, the size of a hickory-nut. It was found high on the posterior pharyngeal wall and almost entirely covered by the soft palate. No adenoids were present.

A baby two years of age had been ill for a week with tonsillar diphtheria and was thought to be recovering, when suddenly the voice became hoarse and croupy, with gradually increasing dyspnea. Both expiratory and inspiratory obstruction were present, such as we expect in laryngeal diphtheria, and the attending physician, an excellent practitioner, naturally concluded that the diphtheric process had extended to the larynx. There was stiffness of the neck but no nasal obstruction (see above). There was slight difficulty in swallowing. Inspection of the throat with a dim light revealed nothing but the enlarged tonsils. I was called to intubate, and finding the respiratory obstruction sufficient to require intubation, I proceeded to make a digital examination, as is my custom before intubating. I was not a little surprised to find a soft, fluctuating mass low down in the pharyngeal wall, extending below and pressing against the glottis. The abscess was opened, with immediate relief to the obstruction.

A baby, seven and a half months of age, was an inmate of the country branch of the New York Infant Asylum during my service in that institution.* My attention was first called to the child because of the difficulty in swallowing. There was very little obstruction, but the voice was harsh, hoarse, and croupy. About a month previous there had been a suppurating submaxillary adenitis. On examining the throat, a large abscess was visible on the right pharyngeal wall, extending downward as far as could be seen. This case afforded my first experience with retropharyngeal abscess, and a Denhard gag of the O'Dwyer set, which should never be used in these cases, was introduced while the child was held in an upright position by the assistant. While I was feeling for the thinnest point of the sac for a suitable place for the incision, the child suddenly stopped breathing, and became limp and apparently lifeless. An intubation tube, the smallest of the O'Dwyer set, was quickly introduced without the gag. After several minutes of artificial respiration, the use of oxygen, and free hypodermatic stimulation with brandy, respiration was again established. The first inspiration was so long delayed that we had almost given up the case as hopeless, when the first short gasp occurred. In half an hour the child had sufficiently recovered to allow the opening of the abscess. This was done without a gag, with the tube in position. After a copious discharge of pus, the tube was removed and the child recovered. In this case the suffocation was doubtless due to the introduction of the gag and the pressure of the finger, which forced the pus into the lower portion of the sac which extended below the glottis, where the pus exerted sufficient pressure to prevent the entrance of air.

A private patient one year old had diphtheria—laryngeal, faucial, and tonsillar. Under 9000 units of antitoxin and intubation satisfactory progress was made, and on the eighth day of the illness the tube was removed. It had to be replaced in a few minutes because of returning dyspnea. Upon replacing the tube an abscess was found in the right posterior pharyngeal wall, pressing upon and extending below the larynx. The presence of the tube had prevented the recognition of the abscess. Upon determination of the cause of the obstruction the abscess was evacuated, but the marked edema of the glottis still caused considerable respiratory obstruction, and the tube was required for two weeks longer. The child made a perfect recovery.

The above cases are cited in detail in order that the reader may the more fully realize that retropharyngeal abscess may exist with-

* The case was reported at the time by Dr. Henry E. Tuley, assistant resident physician.

out the so-called "characteristic symptoms," and also to emphasize the fact that many cases have been, and will continue to be, overlooked until physicians use the finger as an aid to diagnosis in the diseases of the upper respiratory tract. It is to be remembered that there is no "characteristic breathing" and no "characteristic position" of the head with retropharyngeal abscess. The disease is usually secondary to retropharyngeal adenitis due to infection from adjacent diseased structures. Occasionally the abscess points outward and requires external incision.

Fever.—There is no characteristic temperature: it may vary a degree or two, from the normal, or it may range high—from 103° to 105° F.

Treatment.—There is but one means of treatment—incision and evacuation of the pus. In order that this may be done it is necessary that the child be under perfect control. The arms should be bound to the sides with a large towel or a small sheet, securely pinned. The child is held in an upright position on the lap of the attendant, who passes his left arm around the child, while his right hand grasps the forehead, drawing the head for further support backward against his right shoulder. The operation should be performed in a good light—either reflected light from a head-mirror or direct light from a window. With a tongue depressor in the operator's left hand holding the tongue out of the way, the mouth is kept open, and the right hand is free to make the incision, for which an ordinary scalpel is used. The incision should be made from above downward, at least one-half inch in length. A basin should be in readiness and the attendant should be instructed to invert the child at a word from the operator as soon as the incision is made. This allows the pus and blood, which, if aspirated into the trachea, may produce fatal results, to stream out of the mouth. While the abscess is discharging and the head is dependent, the clean index-finger of the operator should explore the cavity, enlarge the opening, if necessary, and remove any necrotic tissue that may be present. The case should be carefully watched for several days, as the opening may close before resolution is complete, particularly if it has not been enlarged with the finger. Recovery is usually complete in from five to seven days.

RETROPHARYNGEAL ABSCESS—TUBERCULOUS CARIES OF THE CERVICAL VERTEBRÆ

This is usually wrongly described as associated with idiopathic retropharyngeal abscess. The tuberculous condition actually is a part of, and results from, tuberculous disease of the spine, which will be referred to under the proper headings.

IRRIGATION OF THE THROAT

Indications.—In cases of peritonsillar abscess, retropharyngeal abscess after operation, or sloughing ulcerative processes in the throat, such as we see in diphtheria rarely, but with comparative frequency in

scarlet fever, irrigation of the throat with hot normal salt solution is of distinct therapeutic value. The relief to the pain, particularly in quinsy before operation, is sufficient to warrant this treatment. Those who have thus treated the fetid, sloughing throat of scarlet fever, for example, need no argument as to the possible advantages. Gargling is a measure of very limited usefulness even for those children who do it well, for the reason that the solution employed scarcely comes in contact with the postpharyngeal wall and the lateral faucial structures. For a great majority of older children, and all young children, such a method is practically useless so far as the cleansing of the deeper faucial structures is concerned.

Cervical adenitis, acute, persistent, and suppurative, is the direct result of throat infection. Acute suppurative otitis is always due to throat infection. An important means of preventing these conditions, with their distressing consequences, is an effective throat toilet. Often in scarlet fever not a small part of the systemic infection after the third or fourth day is through the throat. The irrigation should be done two or three times a day as follows:

Operation.—The child is wrapped in a sheet, which is securely pinned, binding his arms to his sides. He rests on his right side, without a pillow. Directly under his mouth is a pus-basin to catch the outflow. A new fountain-syringe, containing a hot salt solution, 120° F., is suspended about three feet above the child's body. The largest size of the hard-rubber rectal tip is fastened to the pipe and the tip is placed between the child's teeth. The current, interrupted every few seconds, should be forcible enough to increase its efficacy as a cleansing agent, the volume of fluid being so small that no inspiration of the water occurs.

The first irrigations will arouse more or less rebellion on the part of the patient, and but one-half pint of the solution need be used. With older children, no trouble will be experienced after the relief afforded by the first irrigation is appreciated. In treating refractory young children, from two to four years of age, the assurance that there will be no pain, and a promise of reward, will reduce the struggling to a minimum. It is not to be expected that the child will not cough; in fact, a moderate amount of coughing is desirable, as it dislodges the pus and sloughing tissue, allowing the solution to cleanse the parts more effectually.

THE TONSILS

Anatomically, the lymphoid structures in the pharynx, termed tonsils, consist of several groups. Of these, the faucial and pharyngeal structures are clinically of most importance.

The *faucial tonsils* are situated one on each side of the oropharynx, between the anterior and posterior pillars of the fauces. The tonsil is roughly ovoid, and in early life about 2 cm. thick, the longest measurement being the vertical diameter. The inner surface presents many depressions or crypts. These are most numerous in the upper portion. Above the organ there is a larger depression called the supratonsillar

fossa. This frequently serves as a pocket for the development of suppurative inflammation. On its outer surface the tonsil is covered by a fibrous capsule, from which the reticulum of connective tissue supporting the lymphoid structure is derived. In close relation to this surface is the ascending palatine artery. The internal and external carotid arteries are normally about 2 cm. distant, but as a result of inflammation and hypertrophy in the tonsils, these vessels may be less remote. Branches to the organs are derived chiefly from the ascending pharyngeal and facial arteries, but also from the lingual and descending palatine. Hemorrhage following operations arises principally from the ascending palatine, the ascending pharyngeal, and tonsillar branches of the facial. Operative wounds of the carotids are very rare.

The *pharyngeal tonsil* is a single structure, occupying the postero-pharyngeal wall. According to Piersol, without being markedly hypertrophied, it may encroach upon the nasopharyngeal space.

The *tubal tonsils* and the *lingual tonsils* are developed respectively at the Eustachian orifices and over the posterior third of the tongue. Scattered collections of the same tissue unite with the larger masses described, and form an irregular guardian-ring encircling the upper part of the pharynx.

TONSILLITIS—ACUTE FOLLICULAR TONSILLITIS

Tonsillitis consists in an inflammation of the mucous membrane and glandular structure of the tonsil.

Age.—No age appears to be exempt. I have seen the condition in infants three or four weeks old. The great majority of the cases, however, occur between the second and twelfth years.

Etiology.—Tonsillitis is due to a mixed infection, with the streptococcus predominating. The disease is exceedingly infectious, and frequently occurs in epidemics.

Predisposition.—One attack predisposes to another by preparing a suitable culture-field in the crypts. Children in whom lymphatism is prominent, and in whom the glandular structure possesses a poor resistance, are the most susceptible.

Pathology.—The tonsils undergo considerable enlargement, and the crypts become filled with exudate consisting of epithelial detritus, mucus, pus, and bacteria. Occasionally the exudate covers the surface of the organ in the form of a pseudomembrane similar in appearance to that occurring in diphtheria. The pathogenic bacteria most frequently present are the streptococcus, staphylococcus, and pneumococcus. Of these, the streptococcus is so frequently a cause of the inflammation that in many epidemics the term tonsillitis has been superseded by the convenient designation, "streptococcus sore throat." When the cellular infiltration in the depths of the tonsil becomes extreme, suppuration and abscess-formation, combined with severe edema of the peritonsillar tissue, is not uncommon. If the discharge of such a collection of pus is not spontaneous or else obtained by early incision, complete des-

truction of the parenchyma and the formation of a retropharyngeal abscess may result.

Symptoms.—The onset of tonsillitis is usually sudden and may be attended by a chill. In a few of my cases an attack has been ushered in by convulsions. However, the usual mode of onset is with fever—101° to 103° F., lassitude, loss of appetite, and muscular soreness. Young children may show difficulty in swallowing, and older children may complain of pain in the throat. Not every case of tonsillitis, however, is characterized by the existence of such pain. Inspection shows that the tonsils are swollen and reddened and perhaps covered with scattered, light-colored, cheesy deposits. In some instances the local signs consist only of the swelling and redness; in other cases the cheesy deposit exists as an early manifestation. The spots of exudate may remain distinct and single, or they may coalesce, forming a pseudomembrane. During the attack the patient feels decidedly ill, and often gives evidence of considerable prostration. The temperature ranges from 103° to 105° F. Slight swelling may occur in the lymphatic glands at the angle of the jaw, but this is usually absent. In a comparatively small percentage of cases the associated adenitis will be very pronounced. A great deal of tenderness of the glands, with a sore throat, is a suspicious sign, and should lead one to examine very carefully for diphtheria..

Duration.—An uncomplicated attack of tonsillitis lasts from three to five days. If the temperature continues for a longer period than six days, the possibility of complications should be excluded.

Prognosis.—The prognosis is favorable; when uncomplicated, the disease is never fatal.

Complications.—Cervical adenitis, otitis, peritonsillar (quinsy), and retropharyngeal abscess are the most frequent secondary conditions. Infrequent complications are endocarditis, pericarditis, and pyemia.

Differential Diagnosis.—Tonsillitis must be differentiated from tonsillar diphtheria. There are few harder problems, and, in fact, in many cases, early in the attack, the solution is impossible without a bacteriologic examination. The following characteristics of the average case of each of the two diseases may aid us in differentiating:

Tonsillitis.—Onset sudden; fever high at onset—102° to 105° F. Glands at the angle of the jaw swollen slightly, if at all. Exudation, follicular, appearing as small dots; may form membrane through coalescence.

Tonsillar Diphtheria.—Onset gradual; fever usually low at onset 100° to 102° F. Lymphatic glands at the angle of the jaw considerably swollen. Membrane present on the tonsil appearing in thin, grayish layers which gradually become thicker and more extensive.

Mixed Infection.—A case of mixed infection may at first present the picture of typical tonsillitis. The temperature may vary from 103° to 105° F. Pain upon swallowing, prostration, and loss of appetite may exist together with a follicular exudation. Such a case may remain stationary for twenty-four to forty-eight hours. The dots then coalesce, forming a firm membranous deposit; the lymph-nodes at the angle of

the jaw enlarge; and, in short, both the clinical manifestations and the bacteriologic examination show that we have to deal with a case of diphtheria.

These cases of diphtheria which are preceded by a clinical tonsillitis are probably the most dangerous. The primary condition is diagnosed as tonsillitis, and for several days is considered to be only a tonsillitis, in spite of the membranous deposit which later forms. This delay in making the diagnosis gives abundant opportunity for the exposure of other children, and postpones the use of antitoxin, rendering the remedy, when finally given, of little or no avail. It is my rule to consider as diphtheric every case in which there is a pseudomembrane on the tonsils, and to treat such a case with antitoxin without waiting for a bacteriologic examination. Furthermore, when there are other children in the family, I invariably quarantine every case of simple tonsillitis.

Treatment.—Local treatment of the diseased parts in tonsillitis by spraying, swabbing, and painting has been of very little service in my hands, particularly in dealing with children under four years of age. When the patient is held by force for such treatment, thoroughness is impossible, and little or nothing is accomplished. For tractable children and those old enough to understand what is being done, gargles, sprays, and irrigations are useful in so far as they relieve pain and cleanse the diseased parts. A useful gargle is the following:

℞ Sodii salicylatis,
Sodii biboratis,
Sodii bicarbonatis.....āā gr. xlv
Essentiæ menthæ piperitæ..... ʒj
Aquæ..... q. s. ad ℥ij
M. Sig.—One teaspoonful in one-half glass of water at 115° F. Gargle entire quantity every hour.

A useful spray is the following:

℞ Acidi borici..... gr. lx
Aquæ menthæ piperitæ..... ℥viij
M. Sig.—Spray throat every two hours.

Irrigation of the throat is indicated in tonsillitis not only for purposes of cleanliness, but because of the relief from pain which it affords. In severe tonsillitis associated with much swelling and consequent tension, the pain upon swallowing is often excruciating. For the irrigation a fountain-syringe and a clean tube for introduction into the mouth are needed. The child may lie down or sit up. If the recumbent position is maintained, the head should be turned to one side so that the mouth rests over a pus-basin, which catches the water as it passes out during the irrigation. If the irrigation be given with the patient sitting erect, a basin held under the chin will catch the water as it flows from the mouth. Two pints of normal salt solution—one teaspoonful of salt to a pint of water—at 115° F. is placed in the bag, which has previously been warmed. The bag is then held two feet above the child's head, and the solution is allowed to flow in a brisk stream against the swollen parts until at least one pint has been used. The irrigations, if found acceptable, may be repeated in from four to six hours.

It is advisable to begin the general treatment with a laxative. One grain of calomel, in divided doses of $\frac{1}{6}$ grain every hour, answers well. The food should be reduced. For a bottle-fed patient one-half the quantity of the usual milk mixture should be given, diluted with an equal quantity of water. The fever, if high, may be readily controlled by cool sponging.

The only drug which has appeared to me to possess any signal value for internal use in tonsillitis is chlorate of potash given in the dosage of 1 grain at two-hour intervals for a child one year of age; 2 grains at two-hour intervals for a child two years of age—16 grains in twenty-four hours; 3 grains at the same interval for a child three years of age—24 grains in twenty-four hours. I rarely give more than 3 grains at two-hour intervals at any age. I have used chlorate of potash in this way for several years, and I have never been able to associate its action with kidney complications in any of the hundreds of cases in which I have used it. This drug is usually given in solution with simple elixir and water or syrup of raspberry and water.

Fig. 24.—Cold compress in position.

Children who have repeated attacks of tonsillitis should have the tonsils enucleated regardless of their size, as diseased tonsils are portals of infection and a source of ever-present danger.

Cold compresses (see Fig. 24) applied to the throat are of aid to older children, who can appreciate the necessity of this measure. This form of treatment is described in detail under the management of acute catarrhal laryngitis. (See p. 283.)

PERITONSILLAR ABSCESS (QUINSY)

The seat of a peritonsillar abscess is in the cellular tissue about the tonsil, and the condition is due to an invasion of the parts by pathogenic bacteria, among which the streptococcus is most frequently present. The source of the infecting agent is almost invariably a tonsil more or less diseased. The abscess may form above, in front of, or behind the tonsil. The disease is seen rather infrequently in children. I have known but one case in a child under six years of age. Quinsy is usually

preceded by tonsillitis. In none of my cases has the abscess followed diphtheria, scarlet fever, or measles.

Symptoms.—The child has tonsillitis with the usual symptoms, and in addition, greatly increased swelling of the throat and pain upon swallowing. He complains of pain in the muscles of the neck on the affected side, and holds the head toward that side. A fairly early symptom is inability to open the mouth to the usual extent. In the average case inspection reveals a reddened, edematous swelling, slightly above and in front of the tonsil, causing a forward displacement of the uvula. In a few instances I have seen swelling develop behind the tonsil, in which case the tonsil on the affected side is displaced forward and appears unduly prominent. A case of this type is very apt to be overlooked unless a digital examination is carefully made, when a soft, fluctuating swelling will readily be felt behind the tonsil. Speech is interfered with, and the act of swallowing is carried out with great discomfort. Young patients will go for several days with little or no nourishment because of the pain occasioned by the taking of food.

Treatment.—The treatment is by incision. This step, however, should not be taken until the abscess is fully developed. If the incision is made too early, it has in my cases invariably closed and required reopening. This closure sometimes occurs even after a timely operation, because when too small an incision is made, the contraction of the abscess wall necessarily following the free discharge of pus and blood effectually closes the opening.

For operation the patient should be wrapped in a large towel or sheet with the arms securely bound to the sides. He should sit in an upright position on the lap of the attendant, against whose right shoulder his head rests. The left arm of the attendant is passed around the patient, holding him firmly, while the right hand grasps his forehead. A Denhard gag of the O'Dwyer set should be used to hold the mouth open. Either by the use of reflected light from a head-mirror, or with the patient facing a window, the operator, using a guarded bistoury, makes a free incision in the abscess from above downward. The escape of a considerable amount of blood usually follows the withdrawal of the knife. Oftentimes more blood than pus is discharged. This is particularly apt to be the case if the abscess is opened early.

It is interesting to note that the cases which open spontaneously never heal spontaneously. After making a free incision it is my custom, during my daily visits immediately after the operation, to prevent a closure of the wound by passing into it a director, moving this up and down to break up any beginning granulations. With free, uninterrupted drainage the case is usually well in from three to five days.

With the exception of a saline laxative, which should be given early in the attack, internal medication is valueless. Two drams of Rochelle salts or 6 ounces of a solution of citrate of magnesia are usually ordered. Other treatment is directed to the comfort of the patient. An ice-bag applied externally before operation may be acceptable. Our greatest means of relief, however, is afforded by the use of the hot saline irrigation,

and the hot gargle where practicable. But few children can gargle well, however, so that ordinarily this measure is best dispensed with. With the few cases where it is practicable, I have found the following prescription and method of use of service:

℞ Sodii bicarbonatis . . . . . gr. xlv
Essentiæ menthæ piperitæ . . . . . ʒj
Aquæ . . . . . q. s. ad ℥ij
M. Sig.—Add 1 teaspoonful to 6 ounces of water at 120° F. and gargle entire quantity every half hour.

The pain occasioned by gargling is another objection to its practice by children. A far more effectual means of relieving pain in this disease, and one which causes no effort nor distress whatever, and which gives astonishing relief, is a saline irrigation which is prepared and given as follows: A heaping teaspoonful of salt is added to one pint of water at 120° F. This is placed in a fountain syringe which is previously warmed. A towel is placed around the patient's neck, to protect the clothing. The basin is held under the mouth, to catch the drainage. With everything in readiness, the bag containing this solution being hung from two to three feet higher than the child's head, the end of the rubber tube, a part of every fountain syringe, without the hard-rubber tip attachment, is placed in the child's mouth and the hot solution is allowed to flow against the inflamed surfaces until the entire pint has been used, pressure being maintained upon the tube so that the flow will not be too free. During the first irrigation or two, there will be more or less coughing, and the child may have to rest after an interval of a few minutes. After he becomes accustomed to the procedure the entire pint may be used without intermission. The irrigations may be repeated every hour and may be used as well after as before operation. When once the child experiences the relief afforded, there will be no trouble in repeating the irrigation.

ACUTE CATARRHAL LARYNGITIS (SPASMODIC CROUP)

In acute catarrhal laryngitis two factors are operative: the local infection causing a swelling and infiltration of the laryngeal mucous membrane, and the laryngeal spasm which is apparently excited by the local process.

Etiology.—The disease may be primary or secondary to inflammatory conditions in the nasopharynx. Exposure to cold is a predisposing cause. Rachitic children, if they develop the disease, are liable to have it in a severe form. They are no more predisposed, however, than normal children. Adenoids and enlarged tonsils are predisposing causes.

Illustrative Case.—A case which demonstrates the possible effects of sudden cold occurred at the New York Infant Asylum during my internship in that institution. A delicate baby, six months of age, was exposed for a few minutes on a very cold, windy, December day, with no head covering and simple ward clothing. Within an hour a croupy cough had developed, and in three hours intubation was necessary.

Pathology.—Early in the attack the mucous membrane is swollen and free from secretion. In older children, in whom a laryngoscopic

examination is possible, the mucous membrane is seen to be intensely congested and dry. When resolution begins, the parts appear glistening and edematous. The lesion itself, however, is never sufficient to produce the obstruction to inspiration peculiar to these cases, as the mucosa is probably alone involved.

Symptoms.—The onset may be sudden or gradual. Cases of gradual onset usually follow an acute inflammatory condition of the nasopharynx, the fauces and larynx becoming successively involved over a period of perhaps two or three days before the laryngitis is well marked. The temperature at the onset is usually not high. One of the early symptoms indicating laryngeal involvement is a hard, dry cough, croupy and "barking" in character. The croupy cough increases in severity toward evening, and is often associated with urgent respiratory obstruction.

In a typical case with sudden onset these are the more frequent: the child retires at the usual hour in apparently good health; a few hours later he wakes with the characteristic cough, active laryngeal spasm, cyanosis, and labored efforts at inspirations involving dilatation of the alæ nasi, suprasternal and infrasternal recession, profuse perspiration, and rapid pulse. The expression is anxious, and the child cries in fear. The temperature is variable, but usually elevated. Expiration is usually unimpeded. Under right treatment the symptoms of spasm subside and do not recur on the following night. The cough which persists for a few days, subsides under proper treatment. In some of the cases, however, the course is not so favorable; the cough continues, becoming stridulous, every inspiration being accompanied by a loud, crowing sound, and in extreme instances the laryngeal obstruction due to the swelling and laryngeal spasm, is so severe as to require intubation. In my experience, however, this is very rare, as I have had to intubate but one child with catarrhal, non-membranous croup—the infant already referred to.

Differential Diagnosis.—Acute laryngitis may be confused with diphtheric or membranous laryngitis. (For differentiation, see p. 611.)

Laryngismus stridulus may be mistaken for catarrhal laryngitis. Differentiation is easy, when one remembers that in uncomplicated laryngismus stridulus there is no cough, and that the laryngeal spasm is usually associated with excitement, fright, or some other nervous influence. Furthermore, laryngismus stridulus does not occur as a definite acute illness; the laryngeal spasm, mild or severe, occurs, as a rule, several times a day over a period of weeks or months. The continuous obstruction, always associated with inflammatory conditions of acute catarrhal laryngitis, is moreover, absent in laryngismus.

Retropharyngeal adenitis or abscess may be confused with catarrhal laryngitis. Respiratory obstruction in acute laryngitis is apparent only during inspiration, and the cough and dyspnea are usually of sudden onset. Retropharyngeal adenitis and abscess are characterized by chronicity. Digital exploration of the pharynx makes the differentiation final.

Treatment.—In the treatment of catarrhal laryngitis in children two conditions must be kept in mind: First, the inflammatory infiltration

and dryness of the parts, producing the metallic cough and the stridulous breathing; second, the laryngeal spasm, which is purely a nervous manifestation, doubtless due to irritation of the terminal filaments of the recurrent laryngeal nerves.

By no means every case of laryngitis in children develops into croup. When croup is present, however, we know that its existence is due to the association of laryngeal spasm with congestion and inflammation.

Fig. 25.—Crib prepared for steam inhalation.

If we are to promote quick recoveries, we must not lose sight of the important nervous element.

Expectorants.—For the simple coughs, without accompanying interference with respiration, treatment with expectorants and steam is of great service, regardless of the age of the child. This treatment should be preceded by the administration of a full dose—from 1 to 3 teaspoonfuls—of castor oil. To a child under one year of age a tablet composed of tartar emetic, $\frac{1}{100}$ grain, with powdered ipecac $\frac{1}{60}$

grain, should be given every two hours—8 doses in the twenty-four hours. If the tablets or powders are not available, 2 drops of syrup of ipecac may be given instead. To a child from one to two years of age a tablet or powder composed of $\frac{1}{100}$ grain of tartar emetic, $\frac{1}{40}$ grain of powdered ipecac, and $\frac{1}{4}$ grain of Dover's powder may be given at two-hour intervals—8 doses in twenty-four hours. After the first day the treatment should be resumed early in the morning, so that by evening, when the cough and spasm are most severe, the full influence of the drugs may be secured. From the third to the sixth year a powder or tablet composed of tartar emetic, $\frac{1}{90}$ grain, powdered ipecac, $\frac{1}{30}$ grain, and Dover's powder, $\frac{1}{2}$ grain, should be given at two-hour intervals—8 doses in twenty-four hours. At least 8 doses of one of the above prescriptions should be given daily in order to get the full benefit of the drugs employed. If the Dover's powder produces constipation, this ingredient may be omitted or counteracted by a laxative. Ordinarily treatment need not be continued more than two or three days. In case the attack is mild, the Dover's powder should be omitted.

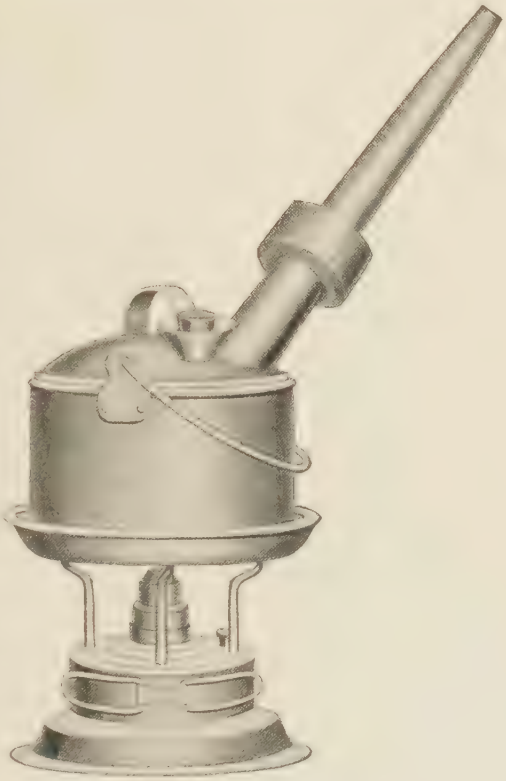


Fig. 26.—The Holt croup kettle.

Cold Compresses.—In the treatment of older children the application of a cold compress to the throat is a valuable local measure. A napkin or piece of old linen so folded that there are at least six thicknesses of the material, should be moistened with cold water at 60° F., wrung thoroughly, and placed against the neck, under the jaw, so as to extend from ear to ear. Over this should be placed a piece of oiled silk or rubber tissue held in position by a strip of thin muslin or cheese-cloth, which should be brought together at the ends and fastened at the top of the head. The compress should be changed every thirty minutes. In the management of very young children this measure is rarely satisfactory, for the reason that it is difficult to force the child to allow the bandage to remain in place. The practice of placing

the compress around the neck, as is often done, is of no value, as the dressing does not even overlie the diseased parts.

Steam Inhalations.—Steam inhalations are effective only when the patient is kept in an inclosed space. Steam diffused throughout the room is of little or no service. The easiest and most practical place for the child is in its crib, which should be covered with a sheet. An open umbrella may be substituted when a crib is not available. Under the umbrella, which rests upon the bed, lies the child, and covering all is a sheet pinned to the umbrella. If preferred, the open umbrella, draped as before, may be placed over the baby-carriage. Any means or apparatus is adequate which will furnish steam and conduct it to the inclosed space. The Holt croup kettle (Fig. 26) when obtainable is always to be used. The steaming may be continued for hours. The sheet should be removed occasionally for a few moments, in order to allow a change of air. Usually a child may be kept under the tent from twenty minutes to one-half hour without such a change. The tent is seldom so close as to prevent all ventilation.

Fig. 27.—Ermold's lamp.

Calomel Fumigations.—A quicker and more effectual means than the treatment with steam is the use of calomel fumigations. The patient is placed under a tent prepared as above. Ten grains of calomel are placed in any tin receptacle, which rests or is held over the flame. The Ermold lamp, made especially for this purpose (Fig. 27), is recommended, although the ordinary alcohol lamp used for warming milk answers every requirement. An ordinary kerosene lamp has served me well in a few instances, the calomel being placed in the cover of a tin can which was held by a pair of pincers over the top of the lamp chimney. Regardless of the method, the fumigation must be constantly watched by some competent person, so as to avoid the possibility of igniting the bedclothes. When the fumes begin to fill the tent, the child will cough considerably. If the cough continues for more than a few minutes, a portion of the vapor should be permitted to escape. The calomel will be consumed in from five to ten minutes, depending upon the degree of heat used. After the tent is filled with the vapor, the child may inhale it for about one-half hour. The vapor produces free secretion from the mucous membrane of the parts, and local depletion, resulting in enlargement of the lumen of the larynx and consequent relief of the symptoms. The fumigation may be repeated after an interval of two or three hours. In a non-diphtheric case I have rarely had to repeat the inhalations more than two or three times.

Antispasmodics.—In the cases of sudden onset, in which the spasmodic

element is prominent at the commencement of the attack, as indicated by the high-pitched, crowing inspiration, and in some extreme cases by the struggle for breath, the cyanosis, the stridor, and the infrasternal recession, the above treatment will not avail. We must combine an expectorant with antispasmodic drugs. A full dose of syrup of ipecac—one to two teaspoonfuls, or sufficient to produce emesis—should be given at once. If vomiting does not result in twenty minutes, the ipecac should be repeated. After emesis has taken place, the antispasmodic remedies should be brought into use. Antipyrin and sodium bromid are especially effective at this stage. Antipyrin appears to have a direct sedative action on the nervous mechanism of the larynx. To a child two years of age the following prescription may be given:

℞ Antipyrini ..... gr. j
Sodii bromidi ..... gr. ij
Syrupi ipecacuanhæ ..... ♏ij–iij
Aquæ ..... q. s. ad ℥j
M. Sig.—One such dose every two hours—eight doses in twenty-four hours.

To a child from three to six years of age may be given:

℞ Antipyrini ..... gr. ij
Sodii bromidi ..... gr. iv
Syrupi ipecacuanhæ ..... gtt. iij
Syrupi rhei ..... gtt. xv
Aquæ ..... q. s. ad ℥j
M. Sig.—One such dose every two hours—eight doses in twenty-four hours.

TRAUMATIC LARYNGITIS

Traumatic laryngitis, although a very rare condition in children, is occasionally observed. It may be caused by the inhalation of steam or irritating gases or the aspiration of carbolic or other strong acids.

I once saw a fatal case due to the aspiration of pure carbolic acid by a child three years of age who was given a teaspoonful of the acid by a five-year-old sister. As soon as it passed the lips the child cried and coughed. None of the acid was swallowed, apparently; but sufficient was aspirated into the larynx to produce intense congestion and sufficient edema to require immediate operative measures. The parts sloughed extensively and the child died in two weeks from pneumonia resulting from sepsis.

Treatment.—No case of corrosive injury to the mucous membrane, sufficient to produce congestion and edema with a resulting inspiratory obstruction which requires operative relief, should ever be intubated except as a temporary expedient, since the presence of a tube will invariably cause extensive sloughing. If the case is urgent, tracheotomy is the only justifiable operation. In two cases due to irritating gases (sulphur dioxid in one case and steam inhalation in another) the treatment consisted in the use of cold applications to the neck by means of wet compresses at a temperature of 60° F. Both cases recovered.

LARYNGEAL OBSTRUCTION

Laryngeal obstruction may be either complete or partial, causing entire cessation of, or greatly impeded, respiration. As the calls upon the physician for aid in these cases are attended with great urgency, it is well to bear in mind the conditions which may give rise to, or directly cause, laryngeal obstruction. These are referred to in detail under their respective headings. In order of frequency they occur as follows:

1. Acute Catarrhal Laryngitis (Catarrhal Croup), p. 284.
2. Membranous Laryngitis (Laryngeal Diphtheria), p. 275.
3. Retropharyngeal Abscess, p. 275.
4. Foreign Bodies in the Larynx (see below).
5. Traumatic Laryngitis, p. 289.
6. New-growths.
7. Laryngismus Stridulus, p. 472.

Acute catarrhal laryngitis, membranous laryngitis, and retropharyngeal abscess are by far the most frequent causes of laryngeal obstruction in children. In children, edema is a very infrequent cause of laryngeal obstruction. When present, it is a complication or sequel of other pathologic states; for example, it may result from an inflammation accompanying a low-placed retropharyngeal abscess, a traumatic laryngitis after the inhalation of irritating gases, or from the aspiration of corrosive fluids or powders.

Illustrative Case.—A patient eighteen months of age, during convalescence from a mastoid operation, developed a cellulitis in the tissue about the wound. The inflammation involved the entire side of the face, the lips, and mucous membrane of the mouth, and eventually extended to the larynx, producing edema, with most urgent symptoms of laryngeal obstruction.

FOREIGN BODIES IN THE LARYNX

Foreign bodies are usually lodged in the larynx by an act of sudden inspiration attended by a quick forward movement of the head, as in coughing or laughing with a foreign body in the mouth or between the teeth. The patient is immediately seized with a violent paroxysm of coughing and suffocation, the severity of which depends upon the size and shape of the foreign body.

Treatment.—Inversion of the patient has been of no service whatever in the cases seen by me. The first procedure is to introduce into the mouth the index-finger, with the hope that a portion of the mass may protrude sufficiently to make possible its removal. Should the attempt fail, a laryngeal forceps should be brought into use, its introduction being guided and guarded by the index-finger. When this is not successful, tracheotomy should be performed to relieve the child from immediate danger of suffocation, after which further surgical procedures may be considered.

ADENOIDS

The recognition of adenoid growths as a cause of nasal obstruction has been appreciated only during the past twenty-five years. The vege-

tations were first described by Dr. Wilhelm Meyer, of Copenhagen, in 1868.

Pathologically, they exist as overgrowths of the lymphoid tissue normally present in the nasopharynx. When the lymphoid elements alone are increased, the growths are soft and spongy, but when, as is frequently the case, there is marked development of fibrous tissue, they are firm and resistant. Increase in the connective tissue is primarily a perivascular process. Ultimately atrophy of the lymphoid tissue occurs, resulting in contracture of the adenoid mass. This change has been commonly attributed only to late childhood and early adult life. Such changes, however, are not uncommon in the very young. The spontaneous abatement of symptoms which is so frequently observed in young adults is more probably due to increase in the capacity of the epipharynx than to actual diminution in the size of the obstructing mass.

Etiology.—Adenoids are found in all classes of children. In proportion to the population, they are as frequent among the wealthy and well-to-do, as among the poorer classes. In fact, if the throats of all children were carefully examined with the finger, adenoid vegetations in the nasopharyngeal vault would be found in 95 per cent. of the cases. This, however, does not mean that 95 per cent. of children should have the adenoids removed, as in some instances the growth is very small and fairly innocent.

The fact that adenoids are so generally prevalent among all classes and conditions of children points to a common causative agent, or group of agencies. I believe that the wide prevalence of the growths is due to the following conditions:

First: There is a tendency to overgrowth of lymphoid tissue in all children.

Second: The location of the normal lymphoid tissue in the pharyngeal vault, subjects this tissue to the irritation of dust and sudden currents of cold air, resulting in the pathologic changes described.

Third: The first and second conditions prepare the parts for the action of the third factor—bacteria.

A curved probe tipped with sterilized cotton when passed into the adenoid tissue of any child, whether the amount of tissue is small or large, will afford a culture of the secretion, in which may be found the streptococcus, staphylococcus, pneumococcus, influenza bacillus, and many other pathogenic organisms. The local congestion caused by the presence of hordes of bacteria further increases the hypertrophy of the adenoid mass.

Heredity is of no immediate consequence. If a new race of children could be born free from adenoid antecedents, they would just as surely develop the growths.

Age.—If a child passes the fourth year without adenoids, he will probably not acquire them later. Children are born with adenoids. At what period in utero they develop is not known. I have seen them at birth in infants with cleft-palate. Adenoids were present, in quite con-

siderable amount, in one infant who was one month premature. Signs of the growths do not ordinarily develop before the end of the first year. The great majority of cases come under observation between the eighteenth month and the fifth year. During the past year, however, I have operated upon four children under nine months of age, because in each instance the parents insisted that the child be given relief from a growth which completely blocked the nasopharyngeal vault. The extremes as regards age in cases upon which I have operated are six months and fifteen years. While we do not see many cases until the patients are two or three years of age or older, I am convinced that, in a large majority, the process begins during the first year.

Symptoms.—Some children have large, roomy nasopharyngeal vaults, while in others, on account of the high palatal arch and the prominence of the bodies of the vertebræ, this space is very small. In the latter cases a very small amount of adenoid tissue causes marked obstruction. The character and amount of the growth likewise determine the degree of inspiratory impairment and the severity of the related symptoms.

Mouth-breathing.—In all cases showing a considerable growth, and in others in which a moderate growth exists in a small vault, mouth-breathing occurs, because the natural respiratory tract is partially blocked.

Rhinitis.—A more or less persistent rhinitis is also present, and this is intermittent—now better, now worse. It is usually worse during the winter; during the summer in some cases it may disappear, only to return with the first cold weather. In other cases, with considerable adenoid growth, the nasal discharge never ceases, but is apt to be worse during the winter and spring months. The child cannot blow the nose, the voice and speech are defective, and the voice has a nasal quality. Certain letter sounds, such as "m" and "n" in the words "spring" and "bang" are pronounced with difficulty. Because of the presence of the mechanical obstruction in the natural respiratory passage, the child breathes through the mouth, not only when awake, but when asleep, and consequently snores, and is noisy and restless, tossing about and assuming all sorts of awkward positions during sleep.

Adenoid Face.—These children all have the characteristic adenoid face. The term, mouth-breathing, does not describe the condition apparent in a pronounced case in an older child. The masseters become so relaxed that a habitual *drop jaw* results. The nostrils are usually small; the nasolabial folds are deepened.

Adenoids Without Facial Deformity.—In a child with a roomy vault, adenoids in small or medium-sized masses may be present without producing facial deformity or obstructive symptoms.

Apart from the characteristic appearance of the patients, two symptoms suggest adenoids:

First: Persistent rhinitis, indicated by habitual nasal discharge, which is ascribed to a chronic cold.

Second: Cough, habitual, mild, or severe. It may be paroxysmal.

I have repeatedly known this symptom to be confused with whooping-cough. (See p. 595.) The cough is always worse when the patient is lying down. Many of these cases pass unrecognized, adenoids being unsuspected because of the absence of obstructive signs, while the cough is attributed to the stomach, dentition, worms, nervousness, etc.

Diagnosis.—The open mouth (see Fig. 28), the snoring at night, the stupid expression, the disturbed articulation, the persistent nasal discharge, the deafness, the inability to blow the nose, the cough, and the chronicity of the symptoms all combine to make a picture afforded by no other condition. No special type of child is affected. We find adenoids not only in the delicate and ailing, but also in the strong and

Fig. 28.—Adenoid face.

well. Among hundreds of cases, I have seen very few in which a part in the production of the growths could be attributed to lymphatism.

Method of Examination.—In children, after the fifth or sixth year, satisfactory examination by means of mirrors and illumination is occasionally possible. Occasionally a rhinologist will state that he is able to make all necessary examinations in much younger children, by means of posterior rhinoscopy. I have never seen this demonstrated and do not expect to.

Although such procedure is disagreeable to the patient, I prefer the finger examination in all cases. The child is securely held by an attendant, with the arms pinned to the sides. A mouth-gag or tongue-

depressor is then placed between the teeth, at right angles to the jaw, and held in position by the left hand of the examiner, thus allowing the right finger to be free for the examination. By placing the child in the position represented in Fig. 23, the nature and extent of the growth may accurately and quickly be determined in the same manner.

Association with Enlarged Tonsils.—In the very young, adenoids usually exist independent of enlargement of the tonsils. The older the child, the more frequent in occurrence is the involvement of the tonsils. Enlarged or diseased tonsils without adenoids are found only with the greatest rarity.

Treatment.—Treatment other than by operation is highly ridiculous.

The Operation for Temporary Relief.—Early infancy is no contra-indication to operation, if the conditions are sufficiently urgent. Fortunately, the necessity for a radical operation in those under one year of age is comparatively rare. These little patients, however, may have obstructing growths sufficient to give rise to mouth-breathing and difficulty in nursing, and also to very annoying and persistent nasal discharge. At this age the adenoid tissue is usually very soft and friable. In several instances I have temporarily relieved such an infant by crushing the growth with the clean index-finger tip wrapped in a couple of layers of sterile gauze. The finger-nail should be cut very short and the whole hand thoroughly scrubbed and disinfected. The child should be wrapped and pinned in a large towel, with the arms confined to the sides, and then placed on the back on a bed or table. A clean towel for wiping away the blood should be placed under the head. The mother and nurse should be advised that slight bleeding is expected. When the child is in position, the physician may hold the mouth open with a spoon or tongue-depressor, and then pass the index-finger of the right hand backward into the vault and easily break up the soft, spongy growth which may be present. The adenoids are by no means removed by this method, but their continuity is destroyed and portions of the growth doubtless slough off, thus affording temporary relief. The child will be able to nurse without inconvenience, and the nasal discharge will stop. In six months or a year, however, the symptoms will return and the radical operation should then be deferred no longer.

The combined operation for the removal of both tonsils and adenoids, which is the usual practice, will later be described. (See p. 296.)

HYPERTROPHIED AND PERMANENTLY DISEASED TONSILS.

Chronic enlargement of the tonsils is usually the result of repeated attacks of tonsillitis. Notwithstanding this fact, I have repeatedly seen enlarged tonsils which had never been inflamed. A tonsil is considered abnormally large when it extends beyond the pillars of the fauces. Enlarged tonsils not only produce mouth-breathing, faulty articulation, and catarrh of the Eustachian tube, but are doubtless a factor in the etiology of adenoids.

Without being enlarged, a tonsil may still exist as a menace to the owner. The very small tonsil which is badly diseased, and the small,

deeply buried tonsil, largely covered by the pillars, are sources of great danger. In the crypts—whether the organ is large or small—are harbored myriads of bacteria capable of producing repeated attacks of acute inflammation. The streptococcus, staphylococcus, colon bacillus, pneumococcus, the tubercle bacillus, and the Klebs-Löffler bacillus all abound. The crypts of diseased tonsils unquestionably may supply the infective agent in pericarditis, endocarditis, nephritis, anemia and the various toxemias classified under the broad term of rheumatism. Adenitis, both tuberculous and simple, is very rare in children who do not have foci of disease in their throats.

The Necessity for Operative Interference in Cases of Diseased Tonsils and Adenoids.—The simple indication to relieve mechanical obstruction is by no means the sole criterion in advising operative measures. Diseased tonsils are responsible in no small degree for many of the complications attending other diseases. In influenza, diphtheria, scarlet fever, and measles the throat always shows active participation. A child free from adenoids and diseased tonsils presents greatly increased resistance to all these diseases; and complications in such children, particularly as relates to the lymphatic glands and ears, are most unusual. During even a common cold, however, a mass of adenoids in the vault serves as a very efficient means of conveying infection to the middle ear. A small percentage of middle-ear cases develop mastoid disease, and in a still smaller percentage sinus thrombosis, with or without jugular involvement, is the outcome. In advising parents, the physician should clearly portray the culture-field which the child may be carrying in the upper respiratory tract.

Operation for Permanent Relief.—I regard this as an operation with which the general practitioner should familiarize himself. The operation is not performed alike by all. Some prefer the sitting position without an anesthetic; others employ anesthesia and raise the patient to a sitting position at the time of the operation. It is my opinion that an anesthetic should be used in every case unless contraindicated by some such condition as lymphatism or cardiac or kidney disease, which might make the anesthesia dangerous. In operations upon children over two years of age my preference is to give nitrous oxid gas to produce unconsciousness, and then to substitute ether. This procedure is far more agreeable to the patient than the use of ether from the beginning. Primary anesthesia is all that is required. In dealing with the very young, for whom gas is not permissible on account of producing cyanosis, ether alone may be used. Chloroform I have learned to regard with much distrust. A boy three years of age upon whom I was to operate for adenoids came so near dying under chloroform anesthesia that resuscitation was almost despaired of. With another child I had a similar experience. I have never witnessed any unpleasant effects from ether during these operations.

If the operation is to be performed without an anesthetic, the upright position is best. The child's arms should be bound to the sides with a large towel and fastened with safety-pins. He should be held

on the lap on the right side of an attendant, who, by crossing his legs, confines between them the legs of the patient. The attendant's right arm encircles the child, while the left controls the head, which rests against the attendant's right shoulder. A basin should be within reach, as the bleeding is sudden and profuse.

The Radical Removal of the Tonsils and Adenoids.—Until three years ago my method was to remove as much of the tonsil as possible by firm pressure with the tonsillotome and counterpressure by an assistant, but without any attempt at dissection or complete removal of the tonsil. This resulted in the removal of perhaps two-thirds or seven-eighths of the tonsil, leaving the capsule and some tonsillar tissue. The great majority of my cases so operated upon were benefited permanently, that is, benefited somewhat. In others the benefit was very temporary, the tonsil soon assuming the former size, the new-growth showing connective-tissue changes and adhesions to the pillars, which made the condition worse than it was before the operation. Even in the cases in which a regrowth of the tonsil did not occur the same tendency to tonsillitis persisted, and the tonsil remained a portal of entry for bacteria. Furthermore, second and third operations have been necessary under this procedure. I have performed the second operation after various other operators, as well as in my own cases.

Forty-eight hours before the operation 10 grains of calcium lactate is given three times daily, the last 10 grains being given after 8 ounces of chicken broth, on the morning of the operation. I am convinced that the calcium lactate lessens the amount of hemorrhage.

The method of procedure is as follows, after the method of Dr. F. S. Mathews: Ether or gas-ether anesthesia is used. The anesthetic is given to the point of abolishment of the corneal reflexes. The child is gagged sufficiently to allow the entrance of the index-finger, which must have free play, our object being to perform such a tonsillectomy as to strip the tonsil from its bed. For the right tonsil I pass my right index-finger into the mouth, and with moderate pressure and finger-point dissection, pass the finger into the superior fossa at the junction of the anterior and posterior pillar. I thus enter the finger above the tonsil, work down behind the capsule, pull the tonsil downward, and with pressure exerted first anteriorly and then posteriorly, separate the structure from its attachments until it hangs by a pedicle formed by the mucosa and blood-vessels. Over this as small a tonsillotome as will engage the tonsil is slipped. The anesthetist makes firm pressure from without, and the operator with firm pressure on the tonsillotome within cuts the pedicle. No tonsil tissue is cut. Without the interference of firm connective tissue, the blood-vessels in the pedicle readily contract.

Mathews places the gag on the side opposite the immediate site of operation. I do not find this necessary except in very young children or those with small mouths.

For the removal of the left tonsil exactly a similar procedure is car-

ried out, excepting that the left finger is used. I have had but little difficulty in removing the entire tonsil by this method.

The *removal of the adenoids* is very simple and requires but a few seconds. I use a modified Gottstein curet, which is built at an angle of about 45 degrees. (See Figs. 29 and 30.) This allows greater play of the cutting blade in the vault. This curet is very sharp. Two or three sweeps suffice to remove all the adenoid tissue, hard and soft.

When the patient is removed from the table, he has recovered sufficiently from the anesthesia to cry vigorously. He is given nothing but broths and gruels for the day. Six to eight hours after the operation an enema is administered. The following day he sits up in bed and plays. The next day he is up and about, and on the succeeding day, out-of-doors. Neither ice cream nor milk is given on the day of the operation. I have experienced no little trouble with children who have been given milk or ice cream within a few hours after the operation. The indigestion and high temperature which are very apt to result alarm the family, who are inclined to attribute the manifestations to infection or something else of a very dangerous nature.

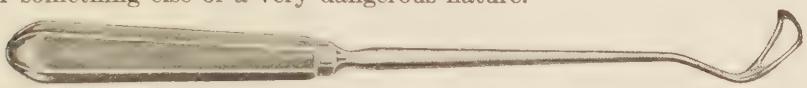


Fig. 29

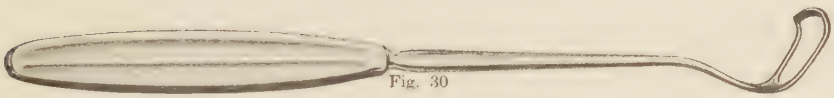


Fig. 30

Figs. 29 and 30.—Adenoid curets.

It is claimed by the opponents of this finger method that complications follow the operation, and that end results occur which are distinctly harmful. I have had one case of postoperative adenitis which responded promptly to local treatment with cold applications. The child had a temperature of 102° F. to 104° F. for three days. I have also had one case in which adhesions were formed by the pillars growing together. I have had no excessive hemorrhage at the time and no postoperative hemorrhage. This, I believe, is due to the fact, as mentioned before, that the tonsil tissue is not cut and the vessels in the pedicle readily contract. The rôle played by the calcium lactate is an uncertain one, but those who have used it, together with myself, believe that the hemorrhage is thereby lessened.

Rarely have I found it necessary to use any other instrument than the finger. In three or four instances a pillar separator and blunt curved scissors have been necessary. The only instruments actually required have been the gag, the tonsillotome, and an adenoid curet.

Conclusions.—The finger-enucleation method has the following advantages:

Rapidity—The child is kept under the anesthetic but a very short time.

Completeness—The entire tonsil is removed with little or no cutting.
Absence of hemorrhage, for reasons already given.
Short convalescence.

Adhesions.—From six weeks to three months after the operation the nasopharyngeal vault should be examined for adhesions. The adhesions are usually attached anteriorly to the posterior surface of the inferior turbinates, oftentimes extending in a fan-shaped form to the posterior and lateral wall. My attention was first directed to the presence of these adhesions by mothers who brought their children for treatment stating that the adenoids had been removed and that the child was relieved for a few months, after which the obstruction became as marked as before. The operator was naturally blamed for not completely removing the adenoid tissue.

Examination of the vaults in these cases disclosed the adhesions. These are usually readily removed with the finger. I have seen three cases, however, in which, on account of the firmness of the adhesions, this could not be done. One patient was recently operated upon by a New York laryngologist for relief of the condition. Besides limiting the normal breathing space, these adhesions may cause a very teasing and troublesome cough.

Illustrative Case.—A girl of nine years came to me because of a persistent cough, which had continued during the winter and which could not be relieved. She had been operated upon for adenoids four years before. I found fairly firm adhesions, which I reduced with the finger. The cough stopped at once. The mother then brought to me two other children who had shown unsatisfactory results from operations, both showing adhesions.

By many operators the existence of these adhesions is denied. I have found them after operations performed by men who said they did not know of them. Every physician will find them in many of his own patients if he will introduce his finger into the vault and search.

Benefits of the Operation for Removal of the Tonsils and Adenoids.—The usual advantages claimed, those relating to mouth-breathing, facial deformities, etc., are sufficiently well known to be omitted. I will call attention, however, to certain benefits that are perhaps not generally appreciated.

In Delicate Children.—In my office work I have occasion to treat every year a large number of children who come because of defective growth, who are suffering from secondary anemia, or who are otherwise delicate. I have observed remarkable improvement in these children following the removal of diseased tonsils and adenoids.

Scarlet Fever.—I have been surprised to note the ease with which children ill with scarlet fever pass through an attack when they have normally resistant throats.

Adenitis.—Adenitis, in any common form, is a very unusual occurrence in a child who has had the adenoids and tonsils properly removed.

Notwithstanding the large number of cases operated upon, I have yet to hear a regret expressed by the parents because the operation was

performed. I myself have had occasion repeatedly to regret that a complete enucleation was not performed in my earlier cases.

The Lungs

EXAMINATION OF LUNGS

Four methods are commonly employed in lung examination: (1) Inspection. (2) Palpation. (3) Percussion. (4) Auscultation.

Inspection.—Inspection of infants and young children is of value in determining the existence and nature of any deformity, as well as the rapidity and character of the respiration. The frequency of respiration varies considerably in children. The younger the child, the more rapid the respiration. The variations are about as follows:

Under one year of age	30 to 40
One to three years of age	24 to 30
Three to ten years of age	20 to 24

The most common deformity is the rachitic chest or so-called pigeon-breast. In association with the rachitic chest, as one of the results of the rachitis, is found the funnel chest, which is characterized by marked depression of the sternum.

The Depressed or Contracted Chest.—This condition is a result of pneumonia with pleuritic exudation and subsequent adhesions between the lung and the chest-wall. Dilatation of the lung is interfered with; the balance between the intrathoracic and extrathoracic air pressure is not maintained, and deformity is the outcome. Inspiration is marked by a lack of motion on the part of the diseased side as compared with the normal side.

The Distended Chest.—When there is effusion into the pleural cavity, and, rarely, when there is pneumothorax, one side of the chest may be much larger than the other. In thin subjects the marking of the ribs is much less pronounced than normal, the sunken interspace being obliterated by the pressure from within. In the distended chest also there will be observed a marked absence of respiratory movement. I have seen a great many cases, however, of pleuritic effusion in which such bulging was not present.

Asthmatic or Fixed Chest.—Chests of this type are quite common in children and are so characteristic that by watching the respiration one may readily make a correct diagnosis of the existing condition. In children normal breathing is of the costal type; that is, there is an outward movement of the ribs in inspiration and a downward and inward movement during expiration. In the emphysematous and those undergoing asthmatic seizures, both sides of the chest become inactive and the respiration is largely diaphragmatic.

Defective Expansion.—In pneumonia and in pleurisy there is delayed and incomplete expansion of the diseased side. In pneumonia, also, there is unusual rapidity of respiration; and in acute pleurisy, characteristic, guarded, interrupted inspiration.

Palpation.—Palpation of infants and young children is of little value. Fremitus serves only to corroborate what may be learned by percussion and auscultation, and is not to be relied upon. The absence of fremitus may mean the presence of fluid in the pleural cavity, or, in a child with a thick layer of adipose, it may not mean anything particularly. The presence of marked fremitus may mean consolidation of the lung. The absence of fremitus is no guarantee that there is no consolidation.

Percussion.—The value of percussion depends upon the normal resonance of the chest when tapped with the finger or other instrument. What is known as normal resonance is the sound produced by percussion over an air-filled lung. The usefulness of percussion in physical diagnosis depends upon the nature or quality of the note and the sense of resistance imparted by the chest to the percussed finger. When possible, percussion should be practised with the patient in a standing or sitting posture. The child should be quiet, if possible, as crying not only disturbs the listener, but changes the quality of the note as a result of the air taken into the chest and the tension on the chest muscles. Light percussion with the finger is preferred to that obtained by pleximeter. The chief value of percussion in pulmonary diagnosis is in determining presence of fluid in the chest.

The terms employed for expressing the findings in a given case are *normal resonance, tympanitic resonance, dulness, tympanitic dulness,* and *flatness.* The possibilities of variations in the resonance within the normal are considerable. The position of the patient, the age of the patient, the condition of the patient, whether thin or fat, whether quiet or crying, are all factors which may cause the percussion-note to vary. The student should familiarize himself with the normal by percussing the chests of many normal children of different ages.

Tympanitic resonance is obtained over a hollow body, as over the stomach, over a distended colon, or a pneumothorax.

Dulness is characterized by short, high-pitched sounds, caused by a solid body or fluid within the chest cavity, which interferes with the production of the normal resonant note.

Flatness is the extreme degree of dulness, and is best demonstrated by percussing a chest filled with fluid. An important feature in determining dulness and flatness is the sense of resistance offered the percussed finger by the chest-wall. In the presence of contained fluid the elasticity and vibration of the chest-wall are greatly diminished and readily appreciated by the finger percussed.

Auscultation.—Auscultation consists in examination of the lung by the ear placed directly against the chest, or assisted indirectly by a stethoscope (p. 305). The use of the stethoscope in infants and young children is almost a necessity. On account of the smallness of the chest and the comparatively large surface of the field covered by the ear during direct auscultation, a larger area of sound conduction is covered than is desirable for purposes of accurate diagnosis. The small stethoscope bell is best, for the reason that when applied to the chests of emaciated infants, it will fit the surface better than a large bell. If the bell does

not accurately fit the chest, extraneous sounds render examination impossible. For accurate work with infants the unaided ear—so-called immediate auscultation—is out of the question. With older children, after the third or fourth year, the ear alone may be employed if the physician is unable to accustom himself to a stethoscope. The physician must accustom himself to correct auscultation with the child crying. This, of course, means forced breathing and a great deal of extraneous noise. To one who is accustomed to lung examination of young infants it matters little whether or not the child cries; in fact, in many instances crying is of distinct advantage, because it brings out the respiratory quality of all portions of the lung. In older children forced breathing is necessary to transmit the sounds we require for diagnosis.

In auscultation all the diagnostician's attention is required for the work in hand. Concentration of the mind is most necessary. For years I have taught students to close their eyes during auscultation, for the purpose of removing all visual objects. All sounds appear louder in the darkness or when the eyes are closed. The position of the examiner is important. He should sit erect or lean slightly forward, but never incline his body more than 45 degrees. When the examiner leans

Fig. 31.—Vesicular breathing.

Fig. 32.—Distant vesicular breathing.

Fig. 33.—Exaggerated vesicular breathing.

too far, the circulatory changes in his ears make his work unsatisfactory and uncertain. In auscultation it is the object of the student to familiarize himself with the sound produced in the lung and transmitted to the chest-wall in the act of normal and forced breathing. The sounds thus produced are known as those of vesicular breathing.

Vesicular breathing has a range of variations within the normal. As in the matter of the study of percussion sounds, repeated examinations of the chest of normal children of various ages and conditions are absolutely required before the nature of normal breathing and its possible variations will be appreciated. Various terms have been used in a comparative sense to describe vesicular breathing, such as "rustling," "blowing," "swishing," "purring," etc.; these are all misleading and useless because there is no other sound resembling the sound of vesicular breathing which deserves mention in comparison. Different investigators have attempted, by means of various devices, to produce the sounds resembling the respiratory murmur in health and its changes in disease, without success.

The respiratory cycle includes the taking of air into the chest—inspiration; and the forcing of the air out of the chest—expiration.

The duration of inspiration in comparison to expiration is in the ratio of five to three. The inspiratory sound is not only longer, but harsher in quality than that of expiration. The respiratory characteristics are diagrammatically described by Cabot, in his excellent work on physical diagnosis. *Cabot's diagrams are here used, but modified to correspond to the respiratory peculiarities of children.*

Inspiration is represented by the upward stroke and expiration by the downward stroke. The length of the upstroke, as compared with that of the downstroke, corresponds to the length of inspiration as compared with that of expiration. The thickness of the upstroke as compared with that of the downstroke represents the intensity of inspiration as compared with that of expiration. The pitch of inspiration as compared with that of expiration is represented by the sharpness of the angle which the upstroke makes with the perpendicular.

In the foregoing, an attempt has been made to describe the various phases of normal respiration. That the two sides of the chest may show considerable variation within the normal, due to changes in the position of the body, the age of the patient, and whether he is at rest or active, as in crying, must be appreciated and learned only by repeated studies of the

Fig. 34.—Bronchial breathing of moderate intensity.

Fig. 35.—Distant bronchial breathing.

Fig. 36.—Very loud bronchial breathing.

normal. Only when the student has so practised upon and studied the normal chest is he ready to take up the study of the signs of disease.

Exaggerated breathing occurs when a sound lung or portion of a sound lung is called upon to do an extra amount of work. This type of breathing is simply compensatory, and occurs when a considerable portion of lung structure is incapacitated by consolidation, as in pneumonia, or by pressure, as in the event of effusion into the pleural sac.

Diminished or weakened breathing exists when both inspiration and expiration are feebler than the normal.

Diminished breathing may be due to fluid in the pleural cavity, to pleuritic plastic exudation covering the lung like a blanket, to partial infiltration of the air-cells, to pneumothorax, to bronchitis, because the air is impeded in its passage to the air-cells, and to acute pleurisy which gives rise to much pain and causes a much shorter excursion of the chest-walls than normal. In all these conditions inspiration is less deep than normal, and diminished respiratory sounds are the result. In laryngeal spasm and in diphtheric laryngitis the respiratory murmur may likewise be greatly weakened because of the failure of sufficient air to pass the obstruction.

Bronchial breathing is symbolically represented and described by Cabot as follows:

The increased length of the downstroke corresponds to the increased duration of expiration, the greater thickness of both lines corresponds to the greater intensity of both sounds, expiratory and inspiratory, while the sharp pitch of the gable on both sides of the perpendicular corresponds to the high pitch of both sounds. Expiration, it will be noticed, slightly exceeds inspiration, both in intensity and in pitch, but considerably exceeds it in duration. As compared with those of vesicular breathing, almost all the relations are reversed.

Bronchial breathing is found in conditions in which there is complete infiltration of the alveolar air-cells, leaving only the bronchi open to the inspired air. The vesicular element in the breathing is, therefore, wanting, and the sound produced by the passage of air through the tubes is alone conveyed to the ear; and the more readily because of the solidity which the consolidated lung presents. Any condition, by causing consolidation of the lung, obliterating the air spaces, may produce bronchial breathing. Thus bronchial breathing of the most pronounced type may be found over a pleural sac filled with

Fig. 37.—Emphysematous breathing.

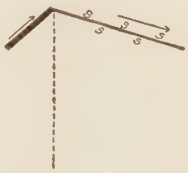


Fig. 38.—Asthmatic breathing: *s*, *s*, *s*, squeaking (musical) râles.

fluid. The lungs solidified by the pneumonia or compressed by fluid (carnified) give rise to bronchial breathing, which is readily transmitted by the fluid under compression to the surface of the chest-wall. Bronchial breathing heard all over the chest (front, back, axilla, and apex) almost without exception means that the pleural cavity is filled with fluid. A failure to recognize fluid under marked signs of general bronchial breathing is one of the most frequent errors made in chest diagnosis in children.

Bronchovesicular Breathing.—I do not recognize bronchovesicular breathing as a distinct type, but one of the forms of weakened or defective breathing.

In *emphysematous breathing* the inspiration is short and somewhat feeble, but not otherwise remarkable. The expiration is long, feeble, and low pitched.

Asthmatic breathing differs from emphysematous breathing, the latter being characterized by greater intensity of inspiration. In asthmatic breathing, however, both sounds are usually obscured to a great extent by the presence of piping and squeaking râles.

Cavernous Breathing.—Cavernous or amphoric breathing will be found over a cavity or a large bronchiectasis. The respiratory sound

has a peculiar hollow quality, both upon inspiration and upon expiration. A low note is produced which has been compared to the sound produced by blowing gently into a wide-mouthed bottle.

Râles.—Upon auscultation of the lungs râles of different kinds will be heard. A râle is the sound produced by impeded air in its passage through a bronchus to the lung. This may be brought about through a spasm of the tube, through thickening of its mucous membrane, or

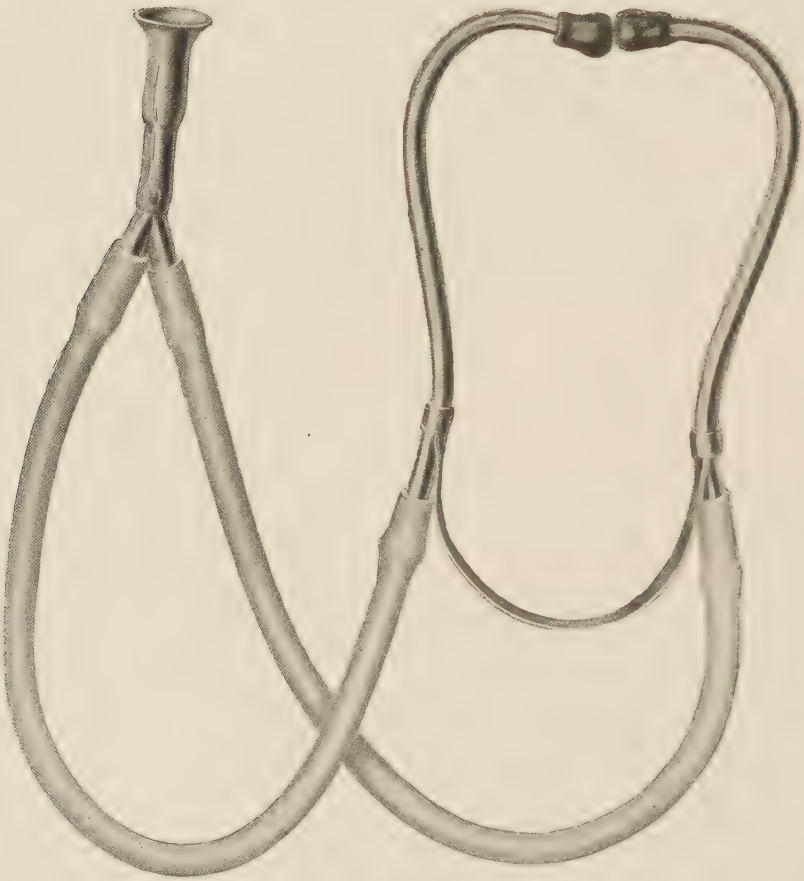


Fig. 39.—Stethoscope.

the presence of pus, mucus, or water in the bronchial tube. Râles of various types will be produced, depending upon the nature of the lesion and the size of the tube affected. Thus when there is congestion with infiltration, there will be sonorous râles in the large tubes and sibilant râles in the smaller tubes.

Sonorous râles are low-pitched snoring sounds, roughened and grating in character. Stridor in laryngitis is akin to the sonorous râles.

Sibilant râles are squeaking, hissing, and crackling in character. In the smaller tubes they indicate the same condition as is productive of the sonorous râles in the large tubes, with this difference, that the advent of bronchial spasm is a considerable factor in the production of sibilant râles. Sibilant râles are almost always present in asthma and in asthmatic bronchitis, and may indicate an early stage of bronchitis.

Mucous or Moist Râles.—Mucous or moist râles are large, medium, and small; and vary in size and number, depending upon the nature

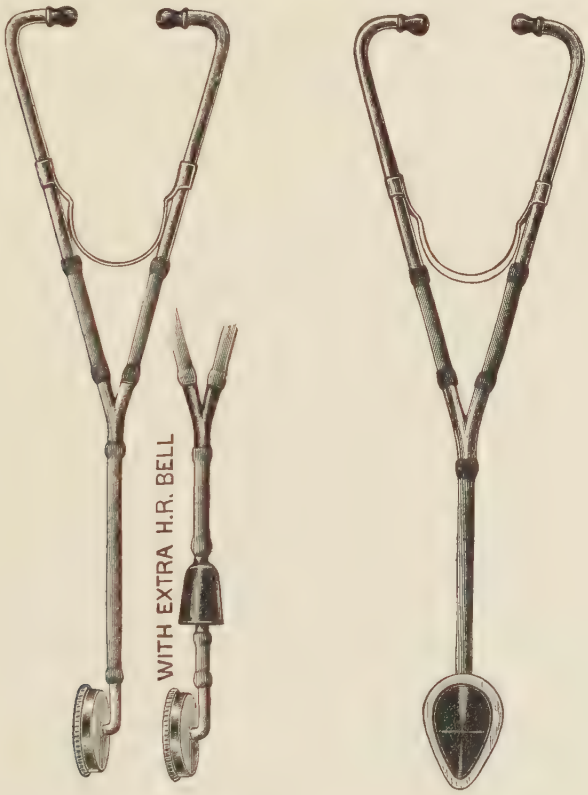


Fig. 40.—The Bowles stethoscope.

of the lesion. They are produced by the passage of air through diseased bronchi containing exudation, and are present in all catarrhal conditions of the lung from whatever cause. In bronchitis and bronchopneumonia, if the examiner is sufficiently industrious, every variety of râle may at some time be heard.

The Stethoscope.—The stethoscope (Figs. 39, 40) is the best instrument for use with children. There are two requirements which every stethoscope should fulfil. The ear-pieces must fit the ear, and the pressure of the spring should be sufficient to hold them in position

without causing discomfort. Flexible rubber connecting tubes are preferred. They should be from 9 to 12 inches in length, thus allowing the operator to move the bell freely over the chest without following the instrument with his head. The long tubes are further better in that they permit the physician's head to remain at greater distance from the child, thus preventing fright in a timid patient. The chest-piece or bell should be small, so as to fit snugly the chests of thin children. The diameter of the bell employed in my own work is $\frac{11}{16}$ inch.

The Bowles stethoscope (Fig. 40) differs from the foregoing in the shape of the chest-piece, which consists of a flat, saucer-shaped piece of metal, the orifice of which is covered over by a thin metal diaphragm. The only advantage possessed by this device is that it enables the physician to examine the child without the change of position and other manipulation necessary in using the instrument first described. For this reason the Bowles stethoscope is useful with children desperately ill, for whom such manipulation is not a safe or desirable procedure. The flat chest-piece which is attached to a flexible tube can readily be slipped under the child, and the examination conducted with the least possible disturbance. This stethoscope, however, should not be used in routine examination, as it accentuates all the chest and heart-sounds, (which in children are sufficiently plain to be detected by the ordinary instrument), and gives an exaggerated impression of the intensity of a normal sound. In instances in which there is weakness of the respiratory or cardiac sounds, this instrument may be of service.

BRONCHITIS

Acute bronchitis, an infection of the bronchial mucous membrane, occurs with great frequency in infants and young children.

The majority of cases occur during the colder months of the year, when houses are overheated, and when sudden changes in the weather are frequent. The sudden advent of exposure lowers the child's resistance, and the infecting agents which are always present are then given a favorable field for activity.

Predisposing Causes.—The chief predisposing cause is absence of resistance to bacterial invasion—a condition peculiar to child life.

Infants and children who are rachitic or who suffer from other forms of malnutrition are particularly susceptible. Chronic rhinitis, enlarged tonsils, and adenoids are predisposing factors of no small consequence.

Bacteriology.—The bacteriologic agents are the pneumococcus, the influenza bacillus, the staphylococcus, and the streptococcus.

Types.—Bronchitis may be divided clinically into three types: Primary, secondary, and chronic.

Primary.—Asthmatic (p. 312).—*Simple.*—In simple primary bronchitis there may have been an exposure to cold or wet, although this is not at all necessary. The disease is more apt to follow exposure to another individual who has a so-called "cold," and who is, temporarily, at least, a germ carrier.

Secondary.—This type is most often found associated with measles,

whooping-cough, and grip, or following an acute catarrhal infection of the upper respiratory tract.

Chronic.—Chronic bronchitis is somewhat rare in the young. It occurs most frequently in conjunction with asthma, or in slow convalescence after bronchopneumonia, and is always present in chronic pulmonary tuberculosis.

Pathology.—In simple bronchitis the lesion is very slight. The mucous membrane may show congestion and slight round-cell infiltration, and there may be elevation or loss of superficial epithelium in small areas where the infection is most severe.

Symptoms.—The onset of acute bronchitis is usually sudden. There is cough, which may be extremely troublesome, interfering with sleep, and, in the case of young infants, rendering the nursing and bottle feeding difficult. The respirations are rarely accelerated above 30 per minute unless there is an associated bronchial spasm. (See p. 312.) There may be moderate prostration; in mild cases there is none. In severe cases the appetite is interfered with. The child is rather peevish and shows general discomfort.

Fever.—The usual range of the fever in uncomplicated bronchitis is from 100° to 102° F. When the temperature remains above 102° F., or makes frequent excursions above this point, I have always found a complication of some kind—something other than bronchitis—to account for the temperature. Frequent sources are some intestinal disorder, a developing otitis, or a beginning bronchopneumonia. If the temperature ranges above 102° F. and the respiration is 40 or more, we may be almost certain of a developing pneumonia.

Physical Signs.—Auscultation of the chest early in an attack will reveal a harsh, roughened respiratory murmur, fairly evenly distributed all over the lungs. Sonorous, sibilant, and mucous râles become audible in from twelve to thirty-six hours.

Percussion.—There is no change in the percussion-notes except in the cases of asthmatic bronchitis (p. 312), which show hyperresonance or tympanitic dulness.

Palpation is here of no aid.

Duration.—The duration of an attack of bronchitis depends to some extent upon the child's recuperative powers, but to a much greater degree upon the method of treatment. A primary case properly managed should be well in five days. Many cases are not treated at all by a physician. It is these cases of neglected bronchitis which furnish a great majority of our cases of bronchopneumonia, a disease which contributes largely to the mortality of children under five years of age.

Diagnosis.—Signs of consolidation in the lung are not necessary for the diagnosis of pneumonia. Cases very often reported as those of capillary bronchitis, in which there is rapid breathing,—40 to 60 a minute,—high temperature,—103° to 105° F.,—and marked prostration, show at autopsy the pneumonic elements which gave during life no other signs in the chest than a diminished respiratory murmur and many

fine mucous râles. Catarrh of the bronchial tubes, manifested by many râles of different types, is the chief diagnostic feature of the disease.

Secondary bronchitis differs from the acute primary form only in the mode of onset. In the secondary type the onset is gradual—three or more days usually being required before the disease is well advanced.

In *chronic bronchitis* the physical signs consist of various types of mucous râles in the bronchi. The medium-sized bronchi are, as a rule, the chief seat of this catarrhal process.

Cough is the most active symptom, and is worse at night. Fever, if present, is due to the associated disease, as chronic bronchitis in a child is rarely an independent illness.

Treatment.—The management of the primary and secondary cases is, in the main, the same, varying, of course, to meet individual conditions or symptoms.

Before indicating what should be done in a case of bronchitis it may be as important, by way of emphasis, to advise what *not* to do. Do not seal the room up tight by keeping all the windows closed. Do not use an oil-silk jacket lined with wadding or any other material. Do not allow the child to be wrapped in blankets and shawls and held against a warm adult body. Do not give the child large doses of so-called "expectorants"—a teaspoonful of a heavy syrup. The temperature of the room should be kept as near 68° F. as possible. There should always be direct communication with the open air. A window lowered an inch or two from the top, or the window-board described on p. 150, is a safe means of assisting in ventilation. The child should be kept in his crib and wear the night-clothing to which he was accustomed in health. Many children with bronchitis do not feel particularly ill and rebel against the enforced inactivity. A patient who cannot be kept under the covers may wear a pinning-blanket or a bath-robe while sitting up in bed, but should not be allowed to sleep in either.

The Diet.—If there is little or no fever, the diet need be reduced but little. If there is fever, 100° to 101.5° F., with restlessness and irritability, the food should be reduced in strength, the same amount of fluid being allowed as in health, the reduction being made by giving plain boiled water frequently to drink between the feedings. The diet of a nursing baby can best be reduced by giving a drink of water before each nursing, and shortening the time allowed for nursing from one-third to one-half. We will thus avoid digestive disturbances, which often act as a very serious complication of the existing disorder. Older children, receiving a mixed diet, may be given toast, cocoa, milk, broths, gruels, and fruit-juices.

Steam Inhalations.—Properly administered medicated steam inhalations are of greater service in bronchitis, particularly in that of young infants, than any other form of treatment which we possess. The steaming is best administered with the child placed in the crib, which is covered and draped with sheets. The croup kettle (Fig. 41) with alcohol lamp attachment is the most convenient means for generating steam. The nozzle of the croup kettle, which rests on a chair or

stand, is carried under the tent at a safe distance from the child's hands and face. For inhalation, creasote has given better results than has any other drug. Ten drops are added to one quart of boiling water and the steaming is continued for thirty minutes. Ordinarily, in an urgent case, steaming for thirty minutes is given at two-and-a-half-hour intervals day and night until the child recovers. Older children, and those in whom the condition is not grave, need not receive the steam after the bedtime of mother or nurse. It is well to allow a change of air in the inclosed space at least three times during the steaming. This is done by raising the sheet for a moment or two and then replacing it. The side of the crib, if preferred, need not be draped.

Counterirritation.—Counterirritation of the skin over the thorax is another very useful method of treatment in bronchitis. Full instructions must be given the mother and nurse as to how the counterirritant is to be applied, or the application will be very indifferently made. In my hands the mustard plaster has been the most convenient means of counterirritation, and has given the best results. It is well to begin with a strength of one part of mustard and two parts of flour. Two or three applications of this strength may be made. Later, when the skin becomes sensitive, the plaster is to be made weaker by the addition of more flour, one part of mustard to five or six of flour. In order to be effective the plaster should remain in contact with the skin from five to fifteen minutes, until a diffuse blush appears. The plaster is prepared as follows: Mix the mustard and the flour, using hot water until a paste of medium thickness is formed. This is to be spread on cheese-cloth, old linen, or thin white muslin, to a thickness of about ⅛ inch. Over this one thickness of cheese-cloth should be placed. The size of the plaster depends upon the age of the child and the area of lung involved. In a case of general bronchitis the entire thorax, front and back, should be covered. It is easier to make two plasters which meet under the arms than to make one to encircle the thorax, as is sometimes done. A circle is cut out for the arms at the upper corners. The plasters are sufficiently large to meet at the sides, as mentioned above, when they may be pinned together. When all is completed, the application really amounts to a mustard jacket. The plaster may be applied from two to four times daily, depending upon the urgency of the case. Counterirritation thus made is of great service early in the attack—during the stage of acute congestion. I question whether plasters are of much use after two or three days have elapsed. After removal of the plaster an application of vaselin is grateful to the patient.

Fig. 41.—Croup kettle with alcohol lamp attachment.

Mustard Baths.—A mustard bath, ½ ounce of mustard to 6 gallons of water, at a temperature of 110° F., is of considerable service

in the very acute cases in young children, with extensive involvement of the fine tubes, usually known as "capillary bronchitis," in which there is a great deal of bronchial spasm. This condition is very apt to develop into bronchopneumonia, even if the pneumonia does not exist from the beginning, which is probably the case. There is considerable shock; the hands and feet are often cold; the respiration is rapid, and the child is considerably prostrated. The bath may be repeated with advantage at intervals of from six to eight hours. It will not be of value after forty-eight hours.

Drugs.—The value of drugs in the management of this disease has been considerably overestimated, and they are mentioned last because they are the least important of the remedial agents referred to.

During the first stage of bronchitis, that of engorgement, indicated by a short, dry cough, and rough, sonorous breathing, small doses of castor oil and syrup of ipecac constitute our best medication. From the first to the third year, two to three drops of castor oil and two to three drops of syrup of ipecac may be given every two hours; after the third year, three drops of syrup of ipecac and five drops of castor oil every two hours. At least eight doses should be given in twenty-four hours. Ordinarily, after twenty-four hours, auscultation will reveal a freer secretion in the bronchi, the fever will diminish, and the child's cough will become loose and less severe. The benefits from the oil and ipecac will be obtained in from forty-two to seventy-two hours, after which this medication should be discontinued.

If the cough and the chest sounds tell us that the bronchi are not yet clear, a combination of tartar emetic, powdered ipecac, and ammonium chlorid may be used. To a child under six months of age a powder or tablet containing $\frac{1}{150}$ grain of tartar emetic, $\frac{1}{80}$ grain of powdered ipecac, and $\frac{1}{4}$ grain of ammonium chlorid should be given at two-hour intervals, eight doses in twenty-four hours; from six months to one year, tartar emetic, $\frac{1}{100}$ grain; powdered ipecac, $\frac{1}{60}$ grain; ammonium chlorid, $\frac{1}{4}$ grain, at two-hour intervals, eight doses in twenty-four hours. If the cough is very annoying and severe, requiring a sedative, $\frac{1}{8}$ grain of Dover's powder may be added to each dose for children under six months, and $\frac{1}{4}$ grain for children over six months of age. From one to three years of age, tartar emetic, $\frac{1}{100}$ grain; powdered ipecac, $\frac{1}{40}$ grain; ammonium chlorid, $\frac{1}{2}$ grain, may be given at two-hour intervals, eight doses in twenty-four hours, $\frac{1}{2}$ grain of Dover's powder to be added to each dose if the character of the cough demands it. The tablet or powder, whichever is employed, should be given in two teaspoonfuls of thin gruel or plain water. After the third year $\frac{1}{80}$ grain of tartar emetic, $\frac{1}{20}$ grain of pulverized ipecac, and 1 grain of ammonium chlorid may be given every two hours, eight doses in the twenty-four hours. The use of tablets or powders should be insisted upon, particularly in treating very young children. The large doses of ammonium salts and ipecac in heavy syrups are to be avoided because of their liability to produce stomach disturbance.

The treatment of secondary bronchitis depends to a certain extent

upon the disease with which it is associated, and the treatment should be modified accordingly. Counterirritation and medicated steam inhalations ordinarily can be used, as they interfere but little with other necessary treatment.

Treatment of Chronic Cases.—In chronic bronchitis the removal of enlarged tonsils and adenoids, fresh air, and change to a dry climate, if possible, are our best means of treatment. In addition, general supportive treatment is to be advised. (See The Management of Delicate Children.) Creasote in small doses, 1 to 3 minims after meals, for a child from two to five years of age, has seemed to me to be of service with some of these children. My greatest success, however, with these cases has been achieved by ignoring the bronchitis temporarily and putting the child in the best hygienic surroundings. Outdoor life inland and a nutritious diet are far better than drugs. In many of these cases, under such a régime, the disease for which the child was brought for treatment has entirely disappeared without any specific medication whatever, showing that the bronchial catarrh was nothing more nor less than a manifestation of greatly reduced vitality.

Differential Diagnosis.—Chronic bronchitis may be differentiated from pulmonary tuberculosis by the temperature range, elevation of the temperature being absent in bronchitis. The examination of the sputum and the von Pirquet skin test are sufficient to establish a diagnosis.

RECURRENT BRONCHITIS

Recurrent bronchitis without the association of asthma and without fever or prostration is occasionally encountered. A typical case of this kind is as follows:

Illustrative Case.—A plump, well-nourished, four-year-old girl had a history of attacks of bronchitis lasting from five to seven days at intervals of not longer than three weeks. The physical examination was negative. The attacks commenced when she was two years of age and had continued for two years. There never was a temperature of over 100° F. with the attacks, and the child was not physically ill. There had never been cyclic vomiting, tonsillitis, or rheumatism. The father was a sufferer from chronic rheumatism. The patient was given a diet suitable for her age (p. 99), meat being allowed every second day. The considerable quantity of sugar which she had been taking was greatly reduced, only enough being allowed to make the food palatable. She was given the following prescription:

℞ Sodii salicylatis (wintergreen) ..... gr. xxxvj
Sodii bicarbonatis ..... gr. lxxij
Elix. simplicis ..... ʒv
Aquæ ..... q. s. ad ℥ij
M. Sig.—One teaspoonful twice daily after meals.

The above prescription was given for five days, followed by an interval of five days' rest. This procedure was continued for five months, during which time there was no bronchitis. Later this medication was given ten days each month for one year, with entire relief of the trouble. Withholding sugar and fat from the diet was continued indefinitely. The patient has had no further inconvenience.

When a child develops joint or bone diseases, the family can usually recall an injury or fall of some sort to account for the trouble. So, also, in the event of bronchitis, an exposure, a change of clothing, or a change in the weather will usually be regarded as a cause of the attack.

In the case above cited, and in many others, such factors evidently have had very little, if anything, to do with the bronchitis, for under the same climatic conditions the attacks cease when attention is given to the constitutional condition, and proper diet and medication are prescribed. The patients are usually of gouty or rheumatic ancestry.

Treatment.—I have successfully treated a large number of these children. Sugar and fat cannot be taken by them.

They should lead an active outdoor life when climatic conditions allow. There should always be communication between the sleeping-room and the outer air. All possible influencing factors, such as enlarged tonsils and adenoids, are to be removed. (This operation, however, is never sufficient in itself to prevent recurrences.)

Diet.—Red meats, including beef, mutton, and lamb, should be given only every second or third day. Sugar is permissible only in sufficient amount to make the food palatable. If the case resists treatment, sugar is to be discontinued and saccharin substituted. Skimmed milk may be given as a drink, eight ounces being allowed both for breakfast and for supper. Green vegetables and cereals well cooked and suitable for the age may be given freely.

There must be a free evacuation of the bowels daily. If there is a tendency to constipation, the oil treatment (p. 242) may be used.

Medication.—These patients are not influenced by the usual treatment for bronchitis, so that expectorant drugs may be omitted. Large doses of bicarbonate of soda do more toward shortening the attacks than do any other forms of medication. To a child five years of age 10 grains should be given at two-hour intervals.

The interval treatment, with diet, must be relied upon to prevent a recurrence of the attacks. Salicylate of soda (wintergreen) is given for five days, in doses of from three to five grains, well diluted, after meals. The salicylate is then discontinued and the bicarbonate is given for five days in the same dosage, when the salicylate is resumed. In this way, by alternating the two drugs or by giving aspirin when the salicylate disagrees, the treatment is continued for months. As the case improves, an interval of rest from all medication is instituted. If it is more convenient, the salicylate and the bicarbonate of soda may be given at the same time.

Bathing.—The skin in these cases should be kept active, and once daily the child should be given a tub-bath in lukewarm water. After the bath a cool spray or spinal douche is used, the temperature of the water ranging from 50° to 70° F. An excessive degree of cold is not advisable; it should be sufficient, however, to insure good reaction after a brisk rubbing with a rough towel.

ACUTE SPASMODIC BRONCHITIS (BRONCHIAL ASTHMA)

Infants and young children may suffer from spasmodic attacks of dyspnea—the manifestation of the disease in the adult. With asthma in the child, regardless of age, there is almost invariably an association of bronchitis. In some the nervous phenomenon of spasm predominates

with little bronchial involvement. In others there is considerable bronchitis, with slight, moderate, or intense spasm. In the case of the infant and very young child the term "*capillary bronchitis*" has been given to two distinct conditions. In one there is an *acute spasmodic bronchitis*, and in the other an *acute pneumococcus infection* of the lungs without localization. In acute asthmatic bronchitis the mode of onset, the lesions, and the fever are all as found in acute simple bronchitis. The bronchial spasm, however, differentiates the two forms from two standpoints: First, the respiration in the asthmatic type is very rapid—I have repeatedly seen it at 80 to 100; 60 is the rule. Secondly, the chest signs are most dissimilar. In the spasmodic cases there may be an entire absence of, or very feeble, respiratory murmur, with inspiration short and squeaking in character, while the expiration is prolonged and accompanied by fine sibilant râles. These signs may be localized in one lung or a portion of a lung, or may occur in both lungs, as I have observed time and again, the same auscultatory signs occurring over the entire chest. There is but little action of the respiratory muscles; the chest appears held in fixed position. The dyspnea may be extreme, and the child suffers from air-hunger. Both the entrance and exit of air are impeded. Cyanosis, profuse perspiration, and marked prostration are apparent if the attack is prolonged.

Percussion elicits hyperresonance or tympanitic dulness. This type of bronchitis may occur in the youngest infant. I have older children as patients who always have the spasmodic condition when there is a bronchitis.

Etiology.—In asthmatic infants and children there is an undoubted gouty (lithemic) diathesis. Not only are these children subject to bronchitis of the spasmodic type, but they also have or may have attacks of croup, eczema, cyclic vomiting, periodic fever, and periodic intestinal crises, with or without fever, and with or without gastric crises. I have under my care a patient who suffered intensely from eczema when an infant and who later developed cyclic spasmodic bronchitis of a very severe type, usually combined with spasmodic croup and cyclic vomiting. This child kept her physician father very busy. When she was not doing one turn, she was doing another, and all came without warning. The child was of a markedly gouty ancestry. I have had other cases as pronounced as this one. Most important dietetic factors in these cases are fat and sugar, particularly cow's milk-fat and cane-sugar. These patients during the asthmatic attack will develop the acetone breath, but not to the degree that is seen in cyclic vomiting, probably because nutrition is not interfered with to so great an extent.

Illustrative Cases.—Case 1.—A girl eight years of age was brought to me three years ago with the history of an attack of asthmatic bronchitis every month for several years. The asthma was not severe. It was present at the onset of the attack, and lasted for perhaps twenty-four hours. The bronchitis usually cleared up in about five days. She had spent but little time in New York because of her so-called frequent "colds." Her mother brought the child to me in view of a contemplated change of residence. In Florida and lower California, where the patient had passed the winter,

the attacks had occurred, but were mild in character. As soon as she returned home the attacks returned, keeping her from school for one week out of every four or five. In taking the personal history the matter of adenoids and tonsils was mentioned, when the mother hastened to inform me that the adenoids and tonsils had been removed twice, thus demonstrating that they were not a factor in the case. The child had never suffered from rheumatism or cyclic vomiting. Aside from revealing a mild secondary anemia and slight emphysema, the physical examination proved negative. The family history disclosed that all the child's antecedents on both sides, for three generations, had suffered either from rheumatism or gout. Her mother had been a life-long sufferer from rheumatism. Upon close questioning, it was found that the child's diet consisted of red meat twice daily; she disliked vegetables, took cereals only when covered with sugar, and drank milk only when two teaspoonfuls of sugar were added to each glass. She had candy and cake *ad libitum*. She was recovering from an attack of bronchitis when I saw her, and was taking an expectorant cough-syrup. This was discontinued, red meat was permitted but twice a week,the sugar was largely reduced, saccharin being used in the milk to satisfy the abnormal craving for sweets. She was bribed by the mother to eat green vegetables and cereals. The desserts consisted largely of stewed fruits flavored with saccharin. Candy, cake, and pastry were forbidden. She was given 4 grains of the salicylate of soda (wintergreen) three times daily for five days, which was followed by 10 grains of the bicarbonate three times daily for five days; then for five days there was no medication. This treatment was continued for six months. During the following six months the salicylate and the bicarbonate of soda were given but five days each out of each month. During the entire year but one mild attack of bronchial asthma occurred.

Case 2.—A most striking case of periodic asthmatic bronchitis occurred in a boy nine years of age. The father had had inflammatory rheumatism. Of the mother's family, the grandmother was an invalid with rheumatism and the grandfather was troubled slightly with it.

The boy was pale, but well nourished, weighing 68 pounds. He was very active mentally. He had had chicken-pox and one attack of tonsillitis. The blood examination showed 78 per cent. of hemoglobin, 5,500,000 red cells, and 8,000 leukocytes. The urine was negative. During the previous year he had had a great many attacks of asthmatic bronchitis. The mother stated that they occurred once every three or four weeks. Previous to this time there had been very frequent colds—so many that the boy's attendance at school had been practically nil. The mother had discovered that sugar did not agree, and very little had been given. He was very fond of red meat, however, and wanted it three times a day. He was given the meat twice a day.

A liberal diet of green vegetables, fruits, milk, and cereals was ordered. In addition, eggs or bacon were to be given for breakfast, red meat three times a week, poultry three times a week, and fish once a week. Sugar was excluded absolutely, saccharin being used. Aspirin in three-grain doses was given after each meal, with five grains of bicarbonate of soda.

This was the treatment for three months, during which term there was one attack of the asthmatic bronchitis. This responded to ipecac, antipyrin, and sodium bromid. Other than one or two slight colds, the boy has experienced no trouble during the past winter. He has lost but little time at school. At the end of seven months he had gained seven pounds in weight.

The bicarbonate and aspirin were given continuously for three months. Since then they have been given alternately, each for five days, *i. e.*, 3 grains of aspirin three times daily for five days, then 5 grains of bicarbonate of soda twice daily for five days.

Cases Due to Direct Irritation.—In this class belong comparatively few, notably those in which the paroxysm occurs independent of bronchitis, but as a result of direct irritation from the pollen of plants or the odors of animals or flowers, the irritant producing a condition known as "hay-fever," as well as the associated asthmatic condition. Hay-fever is rarely seen in children under five years of age.

After several attacks of asthma associated with bronchitis, what is sometimes called a true asthma results; *i. e.*, through the direct irritation, as just mentioned, or through the peculiar susceptibility to odors, such

as those from cats or horses, or otherwise reflexly because of the presence of abnormalities in the upper respiratory tract, the habit becomes once established and thereafter but very little irritation appears necessary to precipitate an attack. While these seizures may occur without clinical bronchitis, in not one of them will the bronchi be found normal, and the intolerance for the intense carbohydrates is as great in the cases in which clinical bronchitis is in evidence.

Treatment.—The management of bronchial asthma consists in care during the attack, and the *interval treatment*, the latter being by far the more important. In infants and young "runabouts" with this type of trouble there is usually considerable bronchitis, and this requires our attention. I have found, in addition to the usual laxatives,—calomel or castor oil,—that a combination of syrup of ipecac, antipyrin, and bromid of soda gives the most prompt results as far as *internal medication* is concerned. For a child six months of age the following prescription has been found useful:

℞ Syrupi ipecacuanhæ ..... gtt. xviij
Antipyrinæ ..... gr. vj
Sodii bromidi ..... gr. xviij
Syrupi rubi idæi ..... ℥v
Aquæ ..... q. s. ad ℥ij
M. Sig.—One teaspoonful every two hours—six doses in twenty-four hours.

For a child one year of age:

℞ Syrupi ipecacuanhæ ..... gtt. xxiv
Antipyrinæ ..... gr. xij
Sodii bromidi ..... gr. xxiv
Syrupi rubi idæi ..... ℥v
Aquæ ..... q. s. ad ℥ij
M. Sig.—One teaspoonful at two-hour intervals—six doses in twenty-four hours.

For a child from two to three years of age:

℞ Syrupi ipecacuanhæ ..... gtt. xxxvj
Antipyrinæ ..... gr. xviij
Sodii bromidi ..... gr. xxxvj
Syrupi rubi idæi ..... ℥v
Aquæ ..... q. s. ad ℥ij
M. Sig.—One teaspoonful in water at two-hour intervals—six doses in twenty-four hours.

In addition, the child will often be greatly relieved by *stimulant inhalations*, as described under Spasmodic Croup (p. 284). If the condition is urgent, the inhalations may be given for thirty minutes with thirty minutes' rest.

Mustard, in the proportion of one part of mustard to two parts of flour (p. 309), so applied as to envelop the entire thorax, will often relieve the spasm sufficiently to reduce the respirations from 10 to 20 a minute. The mustard should remain on long enough to redden the skin, and should not be repeated oftener than once in four hours.

The cold-air treatment in bronchial asthma is contraindicated, regardless of the age of the patient. Warm, moist air at from 68° to 70° F. is best. A sudden blast of cold air may be sufficient to increase

the severity of the paroxysms to a marked degree. Ventilation, however, is a necessity in these cases. The best means of obtaining it is by the use of two rooms, one of which may be aired while the other is occupied. Before the child is changed to the aired room, its temperature should be raised to that of the other.

In older children after the fifth year the bronchial spasm may be considerable, and more active measures may be required to furnish temporary relief. Here the methods usually employed for the same purpose in adults may be brought into use. A few whiffs of chloroform will often be effective. Fumes of nitrate of potash paper will sometimes be of service. At this age, also, a combination of antipyrin and bromid of soda may be brought into use. For a child from five to ten years of age 3 grains of antipyrin with from 6 to 10 grains of bromid of soda, repeated in two hours, will often obtain a cessation of the paroxysm. As soon as the spasm subsides the sedatives should be discontinued. I have never found it necessary to give morphin hypodermatically or otherwise in these cases. In a very severe case, in a girl eight years of age, a combination of antipyrin and codein in full dosage was required to control the paroxysms. She was given ¼ grain of codein and 4 grains of antipyrin at two-hour intervals until three doses had been given.

In the urgent cases La Fetra advises the use of adrenalin hypodermically. Five minims of a 1:1000 solution is given to a child from two to six years of age. A diet with low fat formula, not over 2 per cent., should also be used.

Before instituting interval treatment all growths in the rhinopharynx should be removed, and such abnormalities as hypertrophies or deformities should be corrected, and the child given a suitable living régime.

Interval Treatment.—For the bottle-fed this consists in reduction of the sugar to one-half the amount suitable for the age, and the use of 1 grain of bicarbonate of soda for each ounce of the milk food given. The bowels must be kept properly open, although constipation or intestinal toxemia has never appeared to me to be an important factor in asthmatic children.

The interval treatment for older children is most important, for by it we are able to postpone the attacks. These cases, as I have indicated, are usual in lithemic subjects, and the scheme of management followed out is the same as for rheumatism, chorea, recurrent bronchitis, and cyclic vomiting. Sugar is reduced to a minimum, and red meat is given not oftener than every second day, and then only in moderate amounts. The child's proteid nutrition is maintained by the use of a high-proteid cereal, such as oatmeal, and purées of dried peas, beans, and lentils. The eating of green vegetables is encouraged. Food between meals is forbidden. Fruits are used in moderation and an active outdoor life is encouraged. At bedtime the child is given a brine bath (p. 750), followed by a vigorous dry rub. The mother or attendant is instructed that one bowel evacuation daily must be insured. The medi-

cation consists of bicarbonate of soda, from 5 to 10 grains a day for five days, alternating with the salicylate of soda (wintergreen) in doses of from 3 to 5 grains three times a day. This is continued for a month or two until its effect in preventing a recurrence is noted. If the salicylate of soda disturbs the digestion, the same quantity of aspirin may be given. The further continuation of the medication depends upon the effect already produced. Usually in two months the salicylate may be given in smaller doses. Interrupted medication, however, should be continued for several months. When my cases with a bad family history have been relieved, I continue the diet permanently, giving the medication for but five or ten days and then omitting it for sixty or eighty days, then giving it again for a short time, and continuing thus as long as may be thought best for the individual.

PNEUMONIA

Pneumonia is an infective process, due to bacterial invasion, seen with the greatest frequency in the young. The influence of cold, which is that of shock, producing a lowered resistance, temporarily makes the individual unusually susceptible to the infecting agencies, which are ever present. On account of the different ways in which these infecting agents manifest themselves in the lungs, two types grossly are produced—*broncho-* or *catarrhal pneumonia*, and *lobar* or *fibrinous pneumonia*.

Lobar Pneumonia

Lobar pneumonia is an acute infection of the lungs, primary in character. It may occur at any age. My youngest patient was three days old. Until the second year this type occurs less frequently than the catarrhal form.

Etiology.—The influence of cold is to produce a lowered resistance. Exposure may therefore play a part. The disease occurs with greatest frequency during the winter and spring months.

Bacterial Etiology.—The specific etiologic factor in the production of lobar pneumonia is the pneumococcus of Fränkel (Diplococcus pneumoniæ; Micrococcus lanceolatus). The experimental evidence needed to prove this fact has recently been supplied by Lamar and Meltzer (Journal of Experimental Medicine, February, 1912), who showed that intrabronchial injection of pure cultures of Diplococcus pneumoniæ in dogs produced pneumonia of the lobar type only, corresponding both grossly and microscopically to that lesion as found in human beings.

The pneumococci are found in large numbers in the sputum, but they invade the blood-stream in only about 13 per cent. of the cases, according to the studies of Otten (Jahrbuch für Kinderheilkunde, 1909, lxix) and Churchill (Transactions Amer. Pediatric Society, 1910), a much smaller proportion than is found in adults. Moreover, about half of the cases with positive blood-cultures recovered.

In some cases the disease is caused by the pneumobacillus of

Friedländer, and, in a small group, by the streptococcus, staphylococcus, or Bacillus typhosus.

Predisposition.—Lobar pneumonia in the young is not a disease of the weak. This type of child is the subject of bronchopneumonia. It is usually the strong and vigorous child who develops lobar pneumonia.

Pathology.—The most apparent effects of the disease are those produced in the pulmonary tissue, where there is an exudative inflammation which progresses through four well-recognized stages, to which are applied the terms—(1) *Congestion;* (2) *red hepatization;* (3) *gray hepatization,* and (4) *resolution.* These stages are not always clearly defined; and not infrequently, at postmortem, neighboring portions of a lung simultaneously present the appearances characteristic of two or more stages of the same inflammation. Congestion, consolidation, and resolution have, however, a very constant order of occurrence, and this is well understood when one considers the exudative nature of the inflammatory process.

In the primary stage of *congestion* the involved portion of the lung is the seat of active hyperemia and edema, and becomes darker in color and acquires increased consistence. The alveolar capillaries are turgid, and the epithelial cells lining the air-spaces are swollen. In the stage of *red hepatization* a well-marked exudation into the alveolar spaces ensues. The exudate consists chiefly of fibrin, red blood-cells, and desquamated epithelial cells. The involved lung structure thus becomes practically solid and roughly resembles liver. During the stage of *gray hepatization* the alveoli become choked with additional exudate, which consists chiefly of leukocytes, the blood-vessels undergo compression, and the lung mass becomes swollen and heavy and assumes a gray appearance. The pleura shares in the inflammation and at this period is coated with more or less fibrinous exudate. The stage of *resolution* marks the change by which the air-cells are relieved of their burden and the normal circulation is restored. This process is essentially one of autolysis, involving disintegration of the fibrin meshes in the exudate and degeneration of the masses of leukocytes and desquamated epithelial cells. Much of the liquefied exudate is coughed up directly, but more is absorbed and eliminated through the agency of the lymphatics.

Eventually, the normal lung structure is restored except in those instances in which the occurrence of interstitial exudate has facilitated the development of abscess or gangrene, or the usual dry pleurisy has been superseded by inflammation of the purulent type—empyema.

In cases of typical lobar pneumonia the pneumococcus present in the circulating blood may give rise to localized abscesses or such fatal complications as peritonitis and meningitis.

Localization of the Lesions.—Orth's figures for the localization of lobar pneumonia are—

52 per cent. for the right side.
33 per cent. for the left side.
15 per cent. for both sides.

In 217 cases (Koplik) the right lung was involved in 124 and the left in 93; the upper right lobe in 74, the upper left in 35, and the upper lobe of either lung in 109 cases, as against 100 cases for the lower lobes. Occasionally the central portion of a lobe alone may be involved. The existence of small foci of consolidation is, however, far more characteristic of bronchopneumonia. In lobar pneumonia the lesion is peculiarly distinct and circumscribed, the surrounding lung portions remaining uninvolved.

As a rule, but a portion of one lobe is affected. An entire lobe may be involved, but never, in my experience, has there been found a complete consolidation of an entire lung. In double pneumonia a portion of one or more lobes in each lung will be involved.

Symptoms.—The onset of the disease is sudden, with fever and rapid respiration, which may be found ranging from 40 to 60. There may be cough. The temperature is variable—over 102° and under 105° F. The pulse is rapid—130 to 160—and there is considerable prostration. These are the only symptoms distinctly indicative of lobar pneumonia.

Vomiting, convulsions, stupor, and chill, to which much attention is given by writers, may and do occur with many other diseases, and may and do occur in some cases of pneumonia; thus, in my own cases convulsions have ushered in the disease in 2 per cent.; vomiting in less than 10 per cent.; chill in about 5 per cent. Loss of appetite, coated tongue, and drowsiness are, of course, noted, and these are all present in dozens of ailments.

The prostration is most marked for the first forty-eight hours. After this time the organism appears to adjust itself to the changes induced by the infection. During the first or the second day of illness the temperature becomes established at a high point,—103° to 105° F.,—where it remains, usually with slight variation in a recovery case, until the crisis. This steady high range of temperature (see Fig. 42) is not always followed out by the disease. The fever may fluctuate considerably. In an eight-months'-old child the temperature was that of a typical malaria, 99° F. in the morning, 104° to 105° F. in the late afternoon. The crisis occurred on the eighth day, and the child was promptly well. Thorough examination from every standpoint failed to show other than a lobar pneumonia.

The respiration per minute depends upon the amount of lung involved, the virulence of the infection, and the age of the patient. In children under two years of age, from 60 to 80 respirations per minute are not at all unusual. In older children the respiration is less rapid, often not exceeding 60 per minute. The pulse in young children is in like manner more accelerated—a range from 150 to 180 is not unusual, while in children after the third year the rate may not be above 160.

Duration of the Attack.—The duration is variable. In the event of mild infection, probably associated with good resistance, I have had these patients make the crisis on the third day, even before the physical

signs were positive. Such cases are by some authors said to represent the abortive type.

In the average recovery case the crisis occurs from the fifth to the ninth day. A crisis delayed beyond the ninth day means a very serious infection and a very grave prognosis. I have had recovery cases in which the crisis did not occur until the eleventh day. In one instance the crisis transpired in the thirteenth; and in another, the fifteenth day.

Unfavorable Symptoms.—The most unfavorable symptom in lobar pneumonia is a *low temperature* in the presence of the other characteristic signs—rapidity of respiration, rapid pulse, and prostration.

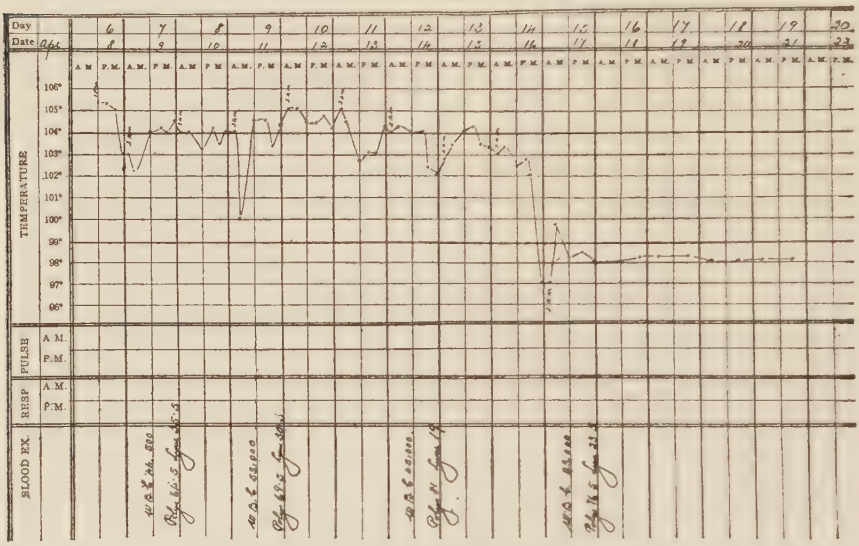


Fig. 42.—Temperature chart, lobar pneumonia.

Illustrative Case.—I was called by a practitioner in a New York suburb to see a case of pneumonia that disturbed him greatly, although it was impossible to make the parents understand that the child was severely ill. There was no elevation of the temperature—in fact, it was slightly subnormal. The child, who was ten months old and had been previously healthy, showed marked pallor and prostration not unlike that presented by an acute gastro-intestinal intoxication case, such as is frequently seen in summer. The respiration was about 40 and the pulse was rapid and weak. There was nothing to account for the illness other than a frank consolidation of the right lower lobe. I made a fatal prognosis, recognizing the probability of death in a few hours. The child died twelve hours after my visit.

In this case the child was overwhelmed by the pneumococcus infection, so that fever or any reaction was impossible.

Cases of this kind in vigorous children are rare. In athreptics and those older children who suffer from malnutrition or who develop pneumonia after a previous exhausting disease the low temperature range —100° to 102° F.—is not at all unusual. With it will often be associated petechial skin eruptions. In such instances the prognosis is most unfavorable.

Tympanites.—The development of marked abdominal distention is a symptom of grave import, indicating a high grade of toxemia. Further, the distention interferes not a little, mechanically, with the already embarrassed respiration.

Vomiting and *diarrhea* are usually occasioned by improper feeding. Uncorrected, they add to the dangers of the patient.

Stupor and *delirium* are cerebral evidences of the systemic toxemia, and while they indicate a severe infection, their presence is more confusing in a diagnostic sense than an indication of danger to the patient. The symptoms are more active, particularly the temperature manifestation, when the right apex is involved. Such a localization, however, has no influence on the prognosis.

Delayed Crisis.—Every day after the ninth, without the critical drop, adds to the danger to the patient.

Lobar pneumonia is rarely fatal before the ninth day. Deaths, of course, occur earlier, due to the severity of the infection, but this is very exceptional.

Among eight fatal cases at the New York Infant Asylum in a six months' service, two died on the eighth day, two on the ninth, two on the twelfth, and one on the twenty-first day of the disease. In the cases of long duration we have to deal with a condition in which the individual is not able to manufacture sufficient antitoxin to destroy the infecting agent or agents, and the question naturally arises, will he be able to do so?

Complications.—The advent of a complication adds a more serious aspect to the disease. A complication may appear at any time during an attack, and change what appears to be a favorable case into one of the greatest gravity.

The complications that have occurred under my observations are as follows: myocarditis, pericarditis, pneumococcus-meningitis, pneumococcus-peritonitis, empyema, peri-arthritis, otitis, pulmonary abscess, and pulmonary gangrene.

Myocarditis.—In very severe infections in which the temperature has been high, a decided irregularity of the heart action develops. There may be no cyanosis or other indication of general heart failure. The first sound will be weak and incomplete.

Pericarditis.—Fluid, serous or purulent, is more often discovered at the autopsy than recognized during the illness. I have seen cases postmortem which showed the pericardial sac filled with pus and fibrin, and the heart surrounded with the latter so as to be scarcely recognized, although no cardiac sign had been present during life, other than that both sounds were defective.

Meningitis of pneumococcous origin (p. 529) is not at all unusual among hospital and asylum patients. An invasion of the meninges by the pneumococcus produces characteristic symptoms (p. 530) quite apart from the usual manifestations of pneumonia, so that recognition of this complication is readily made. Further, when the meninges are attacked, the resulting symptoms are very active. At once there are slow,

irregular respiration, slow, irregular pulse, stupor from which the child may not be aroused, and change in the pupils.

Peritonitis.—Persistent distention of the abdomen, with evident pain on pressure, and obstinate constipation are indications of acute peritonitis. In my hands these cases—five in all—have all been fatal.

Empyema may develop during the pneumonia, in which case the chief manifestation will be a change in the physical signs—the bronchial breathing and bronchial voice changing suddenly to weak, distant bronchial sounds, associated with flatness on percussion.

Empyema, however, is more apt to follow a day or two after the crisis than to occur during the active stage of the disease. It is a complication that I have seen in a large number of cases in different stages of the disease, and the possibility of its development should never be forgotten.

Peri-arthritis will be made evident by pain and swelling of a joint, most frequently the shoulder or elbow.

Otitis is often overlooked because of the absence of pain to locate the trouble. It often passes unrecognized until a rupture of the drum occurs, the fever being accounted for by the lung disease.

In every disease of infectious origin the ears should be subjected to a daily otoscopic examination.

Prognosis.—The prognosis in lobar pneumonia in private cases depends considerably upon whether the patient is under private care in a sensible family, or subjected to ignorant surroundings. If the physician may have the right support the mortality is very low—from 2 to 3 per cent. Among the ignorant and careless it will be higher—from 5 to 10 per cent.—approaching the mortality in hospitals and children's institutions. The high mortality in children's hospitals is due more to the wretched condition in which the patient arrives than to peculiarly severe features of the disease. In infant asylums and children's institutional homes a lack of resistance to disease is the rule, and pneumonia affords no exception.

Diagnosis.—The diagnosis in infants and young children is surrounded with few difficulties. The sudden onset of illness, with high fever, rapid respiration, dilatation of the alæ nasi, respiratory grunt, and rapid heart action, are objective signs of real significance.

Consolidation of the Lungs.—This sign makes the diagnosis positive. The time of its appearance, however, is subject to considerable variation. It may be present during the first twenty-four hours, and I have seen it repeatedly delayed to the fourth day. Rarely it will appear as late as the fifth day. In one case, showing very active symptoms otherwise, consolidation was not apparent until the seventh day. On the day the consolidation appeared crisis occurred. Cases of this type may go through the entire course of the disease and never show definite consolidation. Such pneumonia is usually referred to as "central." The consolidated area is supposed to be deep in the lung tissue and covered by normal lung. There is no doubt but that a pneumococcous infection of the lung may exist for several days and run its entire course without

the process ever going on to consolidation. We know that this is possible in the two or three day cases representing the so-called abortive type.

The Physical Signs.—*Auscultation.*—As already indicated, auscultation may never reveal a sign of the disease other than harsh or sonorous breathing. As a rule, the infiltration of the air-cells will develop sufficiently from the second to the fourth day to produce bronchial breathing and bronchophony.

Over the consolidated area fine pleuritic friction râles will usually be heard at the height of inspiration when the consolidation makes its appearance. In practically every case of lobar pneumonia the pleura over the consolidated surface will be found dry, injected, and often showing a very fine exudation.

Percussion.—Percussion will show dulness, depending in degree and extent upon the nature and distribution of the lesion. Absolute dulness will be present only over the consolidated area.

The chief value of percussion is in differentiating the presence of fluid from extensive fibrinous exudation, a condition sometimes designated as pleuropneumonia.

Palpation.—Palpation is of little value in children, and reveals nothing that may not be learned through auscultation and percussion.

Vocal Fremitus.—In diagnosing considerable exudations of fluid in the pleural cavity, and pneumothorax, the absence of vocal fremitus may furnish corroborative evidence.

Differential Diagnosis.—Lobar pneumonia is to be differentiated from pneumonia of the catarrhal type, from acute pleurisy with massive output of fluid, and from similar cases in which the fluid is less in amount. The differentiation between the lobar and bronchopneumonia will be found on p. 332.

Pleuritic Effusion.—When there is a fluid, pleuritic exudate sufficient to fill the entire cavity, with the fluid under pressure over a compressed and consolidated lung, signs will be transmitted to the chest-wall, closely resembling the signs of frank consolidation. Thus there will be bronchial breathing and bronchophony of a very intense character over the entire involved side anteriorly and posteriorly, at both the apex and the base. Repeatedly in consultation I have found these signs interpreted by the attending physician as meaning a complete consolidation of the lung. It is to be remembered that a lung is never completely consolidated in acute pneumonia. Furthermore, in the presence of a massive fluid exudate percussion will elicit flatness over the entire surface. When the process is located on the left side, the heart displacement indicates the presence of fluid in the pleural cavity.

In cases of effusion, finally, there is an absence of friction-sounds and likewise of râles. When doubt exists, exploratory puncture should always be made. Fluid in lesser amounts is indicated by diminished respiratory sounds, localized flatness, the absence of mucous or pleuritic râles, and displacement of the heart if the exudation is in sufficient amount. Only in cases in which the pleural cavity is absolutely filled

with fluid do we find the voice and respiratory signs of frank lobar pneumonia.

Blood-findings in Lobar Pneumonia.—(See p. 392.)

Treatment.—Lobar pneumonia runs a limited course, with a strong tendency to recovery. It is a disease which children bear well under proper management. There is no specific treatment, and our efforts in restoring the patient to health are supportive only.

When a child is stricken with lobar pneumonia, we know that his physical strength is to be severely tested, and our first effort should be to place him in such a position that he may to the best advantage cope with the enemy. In order to do this every detail of his daily life should so be arranged as to assist all the organs of the body most favorably to combat the changed conditions produced by disease. Telling the mother what to do for the fever and writing a prescription for a cough mixture is a most careless method, worthy of the prescribing apothecary rather than a physician. A proper régime must be established as soon as the child becomes ill. The bowel function, the room-temperature, ventilation, and sleep, as well as special medication, are all to be considered. The child must be kept as comfortable as the conditions allow, and his comfort demands the avoidance of everything causing restlessness or irritability, which throws more work upon the heart and lessens the patient's resistance to the disease.

Cold Air.—During the past few years I have become a convert to the use of cold air in the treatment of lobar pneumonia. These patients unquestionably do better with the windows wide open day and night. In such an atmosphere the respiration is slower, the heart action is stronger, and the patients are much more comfortable, sleep better, and make a more satisfactory convalescence. A woolen hood and suitable woolen clothing should be worn. Dr. W. P. Northrup, of New York, has done much to advance this cold-air treatment in pneumonia.

The Sick-room.—In many families the cold-air management will not be permitted. In such instances the temperature of the room should be kept at 61° to 65° F. both day and night. Wide fluctuations in the temperature should not be allowed. A large room, if at hand, should always be selected, and there must always be direct communication with the open air by an open window. The child should be kept in the crib, and not held on the lap of the mother or nurse.

Quiet should be maintained in the sick-room, only those in attendance upon the patient being admitted. A sick-room is no place for visitors and curious persons. Their presence annoys the child and takes away a certain number of strength units, which may determine the question of life or death. The advantages of the cold room or roof treatment in this respect are obvious.

The Clothing.—The clothing should be the usual night-clothing. I have long since discarded the oiled-silk jacket or any special form of covering. The oiled-silk jacket or a jacket made of cotton wadding is very easy to put on, but very difficult to take off with safety; further, it has a tendency to elevate the temperature of the patient, it makes him

uncomfortable, particularly during convalescence, and prevents the free action of the skin. These objections, with the fact that there is no rational argument for such wrappings, are sufficient to condemn them.

The Bowels.—There should be a standing order with the nurse or mother for an enema to be given if the bowels do not move once in twenty-four hours. One-half to one grain of calomel in doses of $\frac{1}{6}$ grain every hour is usually of considerable service. In a case in which there is very high fever I often order this dosage repeated every three or four days.

Counterirritation.—Counterirritation of the skin is of little service in lobar pneumonia. Early in the attack, when there is pain, a mustard plaster,—one-third mustard and two-thirds flour,—mixed to a paste, spread on cheese-cloth, and placed over the involved area for a few moments, will give signal relief and may be repeated at intervals of from four to five hours. This form of counterirritation is also useful in convalescence in delicate children when the lung clears slowly, and examination reveals feeble breathing and many mucous râles. In such cases two or three applications daily until the lung clears will suffice. Each application should be maintained until the skin is well reddened. If reddening does not occur within ten minutes, the mixture of mustard and flour should be made stronger—one-half mustard to one-half flour. In a few cases of delayed resolution two dry cups daily, applied directly over the involved areas, have been of much service.

The Diet.—See Diet in Illness, p. 100.

Management of Pyrexia.—Whether or not antipyretic measures are to be used, and the nature of the antipyretic to be advised, depends upon the case and the family possibilities relating to care and nursing. One child will bear a temperature without inconvenience which would seriously compromise the chances of recovery of another, so that the thermometer is not a sufficient guide unless the effect of the fever upon the patient be considered. Some children will be delirious and restless and will need antipyretic treatment when the fever is at 103° F. A temperature of 104° F. rarely needs interference. A rise of one degree F. usually means an increase of 20 to 30 heart-beats per minute. In lobar pneumonia I prefer that the temperature should not go above 105° F., even if at the time the child shows but little inconvenience. Such a temperature means an unnecessary increase in the amount of work required of the heart, which itself demands relief in such an emergency.

Hydrotherapy.—Cold water, intelligently applied, is the best means of reducing fever. The water may be used either in the form of a sponge-bath or a cool pack. The sponge-bath (p. 749), repeated at intervals of from two to four hours, suffices in a few cases in which the temperature is readily influenced. As a rule, the cool pack (p. 747) will be required, especially if the fever is particularly high. The sponge-bath, while not controlling the fever as well as does the pack, possesses the advantage of safety even when administered by the most ignorant.

The procedure really amounts to nothing more than sponging the entire body with cool water or alcohol and water. The cool pack requires a trained nurse or an intelligent mother, either of whom should be instructed by the physician as to its use. When cool water is properly applied, and the packs or baths agree, prompt improvement in the immediate symptoms follows. The child, previously restless and perhaps delirious, falls into a quiet sleep; the temperature falls two or three degrees, the pulse becomes slower and fuller, and the respiration less frequent. I have never seen a carefully given pack or bath do harm to a child. In fact, the water is most grateful to the patients, who, when old enough, often ask to have the towel made cooler when it becomes warm and dry from the heat of the body.

Heart Stimulants.—A child must never be given a heart stimulant simply because he has pneumonia. Heart stimulation is usually employed too early in the attack. Only when the pulse shows signs of weakness, great rapidity, irregularity, or reduced volume, has the time arrived for stimulation. For a very rapid pulse, *i. e.*, over 150, tincture of strophanthus has answered better in my hands than any other form of stimulation. For a child from six months to one year old, I order one drop every two hours—at least six doses in twenty-four hours; for a child from one to three years old, one or two drops at intervals of two hours—at least six doses in twenty-four hours; for a child of three years or over, two or three drops at intervals of two hours—at least six doses in twenty-four hours. If the case is a very serious one, the strophanthus may be given every two hours during the entire twenty-four, although if the conditions permit, it is better to disturb the patient as infrequently as possible during the night.

When the pulse is irregular and intermittent, with reduced volume, strychnin is the remedy. To a child from six months to a year old $\frac{1}{300}$ grain is to be given every three hours—six doses in twenty-four hours; from the first to the second year, $\frac{1}{200}$ grain at three-hour intervals—six doses in twenty-four hours; after the second year, $\frac{1}{150}$ grain may be given at intervals of three or four hours—six doses in twenty-four hours. Children who are under strychnin medication should be carefully watched for signs of the physiologic effects of the drug, the first symptoms being an unusual susceptibility to sudden noise and a slight fibrillary twitching of the muscles of the face and the backs of the hands. Instructions should be given, when these symptoms appear, to discontinue the drug until the next visit of the physician. I have repeatedly noticed these signs of the physiologic effects of the administration of strychnin, and they need cause no anxiety. They are actually necessary in order to get the full benefit of the drug. However, it is only in the most severe cases that this drug should be pushed to such an extent.

When the circulation of the skin is deficient, involving coldness of the extremities and cyanosis, indicated by blueness of the finger-nails and lips, nitroglycerin is indicated. To a child under one year of age, $\frac{1}{300}$ grain may be given at intervals of two or three hours—six doses

in twenty-four hours; to a child from one to three years of age, $\frac{1}{200}$ grain at three-hour intervals—six doses in twenty-four hours; after the third year, $\frac{1}{150}$ grain at intervals of two or three hours—six doses in twenty-four hours. Nitroglycerin, if given in large doses, produces headache, of which older children will complain, while nurslings will show their discomfort by restlessness and crying.

Caffein sodiosalicylate is also very useful in cases of this nature, and may with advantage be employed with the strychnin. The dosage for a child from six months to one year is ½ grain. Camphor in the form of the oil of camphor is useful hypodermatically in the condition just described. It may be given in one to two grain doses and repeated in one to two hours. In collapse, $\frac{1}{1000}$ solution of adrenalin hypodermatically, administered in dosage of from three to five drops, is of much use.

Digitalis is rarely used as a heart stimulant for young children. It disturbs the stomach and meets conditions much less satisfactorily than the remedies mentioned. The ammonium preparations are not employed, because their administration, even for a short period, invariably interferes with nutrition by diminishing the digestive capacity.

Alcohol is often prescribed too early. Many of my cases of pneumonia in children pass through an entire attack without one drop of alcohol. Alcohol in any form should be avoided early in the disease. Later, when the case is doing badly, when the strychnin and strophanthus, alone or in combination, fail, the alcohol may be given, and then it may be a life-saving means. It is indicated at this time because it sustains the patient when regular food assimilation is impossible, and at the same time stimulates the heart. Under one year of age I give from 8 to 30 drops of brandy, at two-hour intervals; from one to two years of age, 15 drops to 1 dram at two-hour intervals; over two years, 1 to 2 drams at two-hour intervals. Patients who show profound sepsis will require and consume an enormous quantity of alcohol without showing the slightest intoxicating effect. During my term as resident physician of the New York Infant Asylum a child fourteen months of age, ill with diphtheria, was given 4 ounces of brandy in twenty-four hours without showing signs of stupor or intoxication.

Hypodermic Stimulation.—The use of hypodermic stimulation in children is to be advised in an emergency, or when the stomach becomes intolerant, or when it becomes evident that drugs administered by mouth are not absorbed. If the dietetic means suggested are carried out, and if disturbing drugs, such as the ammonium salts, heavy syrups, etc., are omitted, there will rarely be any occasion to resort to hypodermic stimulation. When indicated, the doses suggested for the stomach may be given hypodermically, with the exception that alcohol should not thus be given in quantities greater than one-half dram of brandy or whisky at one time.

Gavage.—Cases are encountered in which, for a time, on account of the profound toxemia, no food or medicine will be taken. In such instances the giving of stimulants and predigested food by means of

gavage (p. 758), will be of material assistance. The milk used should be completely peptonized, and to it whisky, brandy, and stimulating drugs may be added. The forced feeding should not be used oftener than once in four hours, and preferably only once in six hours. When thus given, the individual doses of the stimulants should be increased.

The Murphy drip method of using a normal salt solution is of service in cases in which feeding difficulties are insurmountable.

Specific Medication.—There is no drug known which will cut short or abort an attack of lobar pneumonia. Mercury in the form of large doses of calomel, quinin, salicylate of soda, and other drugs have no specific action.

As previously stated, our efforts must be directed toward a conservation of the strength of the patient by placing him in the best position to cope with the disease. This management, combined with careful medication to meet special requirements as they arise, constitutes our treatment of lobar pneumonia, and has given us a death-rate of only 2 per cent. in children under two years of age. During convalescence great care is needed in permitting the child to resume his usual habits of life, for in the matters of both food and exercise we must make haste slowly.

Bronchopneumonia (Catarrhal Pneumonia)

Catarrhal pneumonia is preëminently a disease of infancy. On account of its large mortality, and because of its frequent occurrence as a complication of almost every other disease of infancy, it is one of the most formidable ailments which we are called upon to treat. The disease is usually described as primary or secondary. Among the several hundred cases which have come under my observation, comparatively few—less than 5 per cent.—have been primary. Those described as primary usually follow a bronchitis—often a neglected bronchitis. The severity of the disease varies considerably, depending on the age and condition of the child, the nature of the infection, and the amount of lung involved. It is most fatal when associated with diphtheria, measles, and pertussis.

Catarrhal pneumonia demands our most careful attention, not only on account of the delicate organs attacked, but because, unlike lobar pneumonia, scarlet fever, typhoid fever, and many other diseases of early life, this disease has no self-limitation, no cycle. While in treating the other diseases mentioned we are required only to assist a patient through the various stages, in case of catarrhal pneumonia we must do more, for here a cure is demanded.

Etiology.—The cause predisposing to bronchopneumonia is the tender age of the patient, who, on this account, offers little resistance to the infection. Children debilitated from any cause are predisposed for a like reason. Whooping-cough and measles more than any other diseases predispose to bronchopneumonia. In a large number of fatal cases of marasmus and malnutrition, bronchopneumonia is the terminating illness.

Bacteriologic Etiology.—The bacteriologic cause of bronchopneumonia is not a specific entity. There are a number of microörganisms which may cause the disease, and in over 60 per cent. of the cases there is a mixed infection. This is true even in the primary cases. The Diplococcus pneumoniæ (Fränkel) is the bacterium most frequently present, but it is found in pure culture only about one-fourth as often as in combination with other organisms. The streptococcus comes next in order of frequency—three times more often in combination than in pure culture. The Staphylococcus aureus may be present alone, but is far oftener found with the pneumococcus or the streptococcus. The bacillus of Friedländer, either in pure culture or in mixed infection, is a rare cause of bronchopneumonia in children. Since bronchopneumonia may be secondary to a variety of diseases, the causative organism of the primary condition in a given case may be found in the pulmonary lesion. Thus B. diphtheriæ, B. influenzæ, the Bordet-Gengou bacillus of pertussis, B. typhosus, B. pestis, B. anthracis, B. pyocyaneus, or the meningococcus may be found associated with one or more of the pyogenic cocci. B. coli communis is a possible though very rare factor in this disease.

Age.—A great majority of the cases occur in children under two years of age. Over one-half of these patients are under one year of age. After the third year bronchopneumonia is unusual except as a complication of measles or pertussis.

Pathology.—Bronchopneumonia almost invariably occurs as a sequel to acute bronchitis or one of the infectious diseases involving inflammation in the upper respiratory tract. Ordinarily the process begins as an inflammation of the terminal bronchioles, "capillary bronchitis," and by extension involves the air-vesicles and acquires the character of a true pneumonia. Bronchopneumonia is, as a rule, bilateral, and only exceptionally involves a single lobe of one lung. The disease usually produces inflammation of the pleura. The affected lung acquires increased weight and the regions most involved acquire a firmer consistence and a deeper red or a grayer color than normal, depending on the stage of the inflammation, which at the outset occasions intense congestion without much purulent exudation. On section, the affected portions typically appear mottled, owing to the contrast apparent between the masses of purulent exudate in the smaller bronchioles and the surrounding zones of congestion and infiltration. Whether the predominant element is exudation or hyperemia depends on the duration of the process.

Microscopic examination reveals a productive inflammation of the bronchioles and of the walls of the air-vesicles immediately surrounding (Ewing). There is not only an exudate in the air-vesicles, but also an interstitial exudate. In the bronchopneumonic exudate the number of cells is greater, the cells are more predominantly mononuclear, and the amount of fibrin is less than in the exudate of lobar pneumonia. The lesions are distributed throughout the lungs in patches, but show a tendency to become conglomerate as the disease advances. When the inflammation subsides the exudate is removed, as at the termination

of lobar pneumonia by mechanical processes and by the agency of autolysis. The productive character of bronchopneumonia is responsible for the occurrence of its more important sequelæ, none of which commonly follow lobar pneumonia. These are chronic bronchitis, spasmodic asthma, emphysema, and chronic interstitial pneumonia. Pleurisy, when it occurs in children, irrespective of the character of complicating pneumonia, is more often of a catarrhal than a productive type.

Physical Signs.—*Auscultation.*—The signs elicited by auscultation depend upon the stage of the disease and the degree of lung involvement.

The Respiratory Murmur.—The respiratory murmur may be weakened over certain areas, or it may be scarcely discernible. Usually an involved area will be found to shade off gradually to the normal. There may be several of these areas.

Bronchial breathing and bronchophony may be present; their presence while establishing a diagnosis is not essential.

Râles.—Areas of localized fine mucous râles are very suggestive of bronchopneumonia. The fine crepitant râle is often heard over the consolidated area. In cases in which there is a considerable distribution of the pneumonic process there will be a wide distribution of râles, with sibilant and fine, moist, mucous râles predominating. The râles are only evenly distributed in cases of the acute congestive type. In these cases they are heard both on inspiration and on expiration, and are of a very fine, crepitant quality.

Percussion.—In the very acute cases in which the engorgement interferes with the entrance of air into the lungs extra resonance or tympanitic dulness may be found. In other cases the percussion-note serves as an indication of the degree and extent of lung involvement. The signs vary from normal to those of complete dulness.

Palpation.—Whatever may be elicited by palpation is better demonstrated by auscultation and percussion.

Symptoms.—The symptoms are most variable, depending upon the age of the patient, the severity of the infection, the extent of lung involved, and the associated illness and complications.

In nearly all cases in which the process in the lungs is active there are three symptoms which rarely fail to be present: accelerated respiration, fever, and cough. The symptoms are only exceptionally urgent at the onset. Usually there is bronchitis for a few days, without high fever or rapidity of the respiration. Then, apparently on the eve of improvement, the temperature ranges higher, the respirations per minute increase, and the child shows prostration.

Examination of the lungs at this time may reveal localized fine râles, usually posterior, in one or both lungs. As the urgency of the symptoms increases the temperature ranges from 101° to 104° F., subject to considerable variations, and reaches the normal by lysis. (See Fig. 43.)

The respiration is from 40 to 60. The pulse-rate is rarely under 140. The usual range is from 140 to 160. Upon the appearance of these symptoms the chest signs become more marked. Localized areas of

fine râles appear in different portions. There are also areas in which the respiratory murmur is very weak. Consolidation finally develops sufficient to produce bronchophony and bronchial breathing.

Duration.—The duration of a case of this type in the event of recovery is rarely less than three weeks. Often a much longer time elapses before the chest will be free. In the fatal cases there is an increase in the volume of lung involved, shown by the physical signs. The heart action becomes feeble, and death takes place from exhaustion or supervening complication.

Special Types of Bronchopneumonia.—In the description of a disease with as wide possibilities as bronchopneumonia, a large number of types could be laid down which would add confusion to the subject. As in most diseases due to infections, death may take place very early

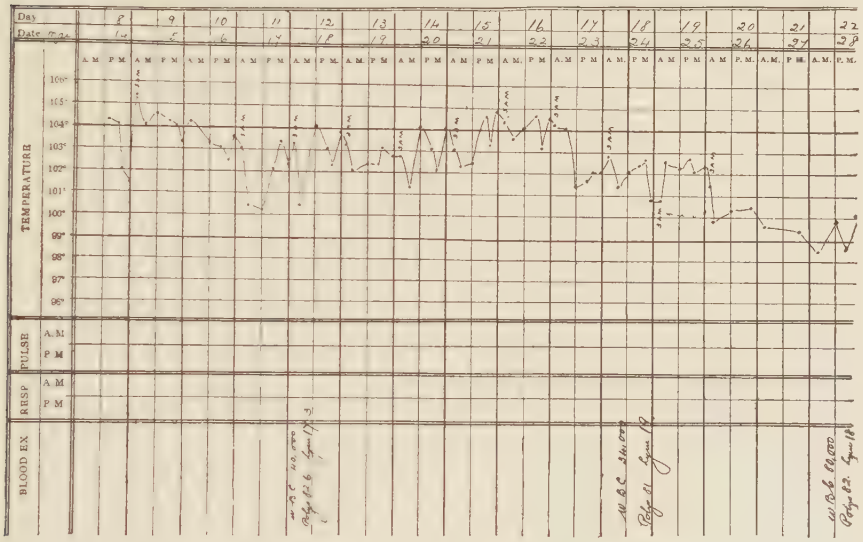


Fig. 43.—Temperature chart. Bronchopneumonia.

or the infection may be so mild as to pass unrecognized. When we take into consideration the age of the patient, the varieties of microorganisms that may be operative, and the amount of lung tissue that may be involved, we can readily appreciate that the disease is subject to many and varied manifestations. Among these possibilities there is one feature that should be emphasized. Consolidation of the lung is not necessary for a right diagnosis of pneumonia. Elevation of the temperature, respiration over 40, dilatation of the alæ nasi, and cough, together with mucous râles, usually definitely localized, are sufficient for a diagnosis of bronchopneumonia.

Cases of the More Active Type.—Bronchopneumonia may be so severe as to be fatal in a few hours. At the New York Infant Asylum I saw several such cases which later came to autopsy. The condition

is usually diagnosed as acute capillary bronchitis. In such patients the onset is sudden, with high fever, 103° to 106° F., rapid, labored respiration, 60 to 80, rapid pulse, 160 to 180, and cyanosis. There is marked prostration from the onset. The child is toxic and rapidly becomes unconscious. Auscultation shows a very marked increase in respiratory murmur and a few fine râles. These patients present evidence of a sudden invasion of the pneumococci of a virulent type.

Doubtless cases of this type are never correctly diagnosed. In two such cases seen by me a positive diagnosis could not have been made but for the autopsy. On account of the urgency of the symptoms and the cerebral manifestations of stupor and sometimes convulsions, the cases are looked upon as those of cerebrospinal meningitis, malignant scarlet fever, suppressed measles, or acute toxemia from intestinal sources.

Postmortem examination shows an intense pulmonary congestion. A free incision in the lung removed immediately after death will be followed by a profuse flow of dark blood. Excepting the congestion and the presence of the pneumococcus, there are few findings to indicate the nature of the disease, the process having been too active and too rapidly fatal for the development of lesions.

Several years ago I was called to perform an autopsy on a six-year-old boy who had died after a two days' illness, the nature of which could not be agreed upon by the medical attendants, none of whom had suspected pneumonia. The autopsy findings were those of an acute pneumonia with intense pulmonary engorgement and with right heart dilatation, which corresponded to the clinical history. Cases of this nature represent the extreme possibilities of pneumococcus infection.

There are other cases in which the symptoms are urgent but less pronounced. The onset is sudden, with high fever, 103° to 105° F. The respiration is rapid, 40 to 60, rarely there is a convulsion. Vomiting is usually present as an early symptom and occurs but once. Except in the nature of the onset, the course in these cases does not vary materially from the usual type first described. The temperature range, physical signs, duration and prognosis are much the same as in the cases of gradual onset.

Bronchopneumonia Following Other Diseases.—When bronchopneumonia follows pertussis, influenza, measles, or diphtheria, it shows no variations from its usual course, but finds a lessened resistance because of what has gone before. The prognosis is therefore correspondingly less favorable, the disease being particularly fatal with or after pertussis, measles, and diphtheria.

Complications.—Among the complications, otitis is probably the most frequent. Empyema occurs in a small proportion of the cases. The same is true of pericarditis, meningitis, arthritis and nephritis. Emphysema is always present to a slight degree, and except in rare instances is demonstrable in autopsies on children dying with bronchopneumonia. If the illness has been a long one, with considerable lung involvement, the emphysema may be very extensive.

Differential Diagnosis.—Bronchopneumonia is to be differentiated

from acute bronchitis and lobar pneumonia. When the respiration is persistently above 40 per minute and the temperature persistently above 102° F., uncomplicated bronchitis does not exist, and pneumonic involvement of the lung is highly probable.

If there is an associated bronchial spasm increasing the respiration, a differential diagnosis is more difficult and sometimes impossible, as pneumonia may exist with a low temperature range.

In lobar pneumonia the well-defined consolidated area in the lung, the absence of bronchial catarrh, and the usually persistent high temperature (see Fig. 42) are sufficient to establish the type of the infection.

The *age* of the patient may be of assistance. Lobar pneumonia is uncommon under two years of age, and the great majority of the cases of bronchopneumonia occur before this period.

Prognosis.—Bronchopneumonia is a disease of high mortality. In children's hospitals and institutions a considerable portion of the total mortality is due to bronchopneumonia. It is safe to say that from 25 to 50 per cent. of the hospital cases are fatal. This, of course, includes all cases of bronchopneumonia, those complicating whooping-cough, measles, scarlet fever, and diphtheria, as well as the terminal cases that occur late with many other ailments of infants and children. The age and previous condition of the patient have a decided influence upon the mortality. The younger and feebler the patient, the less is the chance for recovery.

Rachitis, malnutrition, and marasmus are indirectly accountable for many deaths.

Treatment.—Every child at the commencement of an illness has a definite resistance to disease. In catarrhal pneumonia, for the reasons just given, it must be our effort to preserve every strength unit which the child possesses. An immense amount of vitality in sick children is wasted because of irritability, restlessness, and loss of sleep. One of the first duties in a given case is not to give this or that drug or use this or that local application, but to make the child comfortable—to put him in the best position to withstand disease. We must establish and maintain a high degree of resistance, and must establish a sick-room régime which will make this possible.

The Sick-room.—The value of a constant supply of fresh air is too little appreciated. In every case there should be a direct communication between the sick-room and the open air throughout the attack. Various means of ventilation have been devised, of which the window-board (p. 150) is the most effective, as it separates the sash and allows the free entrance of a current of air which is directed upward. If plenty of fresh air at a proper temperature were available during the early part of the illness, there would be much less use for tanks of oxygen later.

An absolute necessity in a sick-room is a good thermometer. In pneumonia cases it should never register above 70° F. There is a marked tendency to coddle, to wrap, and to overclothe these patients. The patient requires, even during the winter, absolutely nothing more than a

medium-weight flannel shirt, a band, if one is ordinarily worn, and the usual night-dress. Some years ago I discarded the oiled-silk jacket. It is cumbersome, it is impossible to keep clean, and it overheats the patient. An infant with catarrhal pneumonia, heavily clad, in an unventilated, overheated room, and in close contact with an adult body, is tremendously handicapped. There is but one place for a sick infant, and that is in his own roomy crib.

Diet.—In every illness with fever the digestive capacity is considerably reduced. If the usual milk diet is continued, we are very liable to have a gastro-enteric infection added, often as a serious complication, to the existing disease. For the breast-fed child a drink of water should be ordered before the nursings and between them. The nursing hours should be the same as in health, but the time allowed for each nursing should be reduced from one-third to one-half. For the bottle-fed the milk strength should be reduced from one-third to one-half by dilution with water, the quantity remaining the same. Children from two to four years of age should be restricted to a diet of diluted milk, gruels, and broths.

Bowels.—Normal bowel function is more necessary for the sick than for the well. There should be at least one stool in twenty-four hours.

General Treatment.—Having placed the child under the best dietetic and hygienic conditions, we are in a position to use medication to a much better advantage. But in its use, and in performing the various offices for the patient, it must be our effort to disturb him as little as possible. In our anxiety to do, we are very liable to overdo, with disastrous results. If a well child were given syrup expectorants, stimulants, baths, and local applications, something being done for him every hour or two in the twenty-four, he would have to be strong to withstand the treatment. We should treat our ill with still greater consideration. The intervals between which the child is to be disturbed at night should be made as long as possible by giving food, medicine, and local treatment at one time. When possible, I always endeavor to make the interval at least three hours.

Steam Inhalations.—Among the distinctly remedial measures, aside from those administered internally, steam inhalations with creasote deserve an important place. The patient is placed in the crib, which is covered and draped with sheets so as to make a fairly tight inclosed space. The apparatus necessary is an ordinary croup kettle. (See p. 287.) Ten drops of creasote are added to one quart of water and placed in the kettle. The nozzle of the kettle is introduced between the sheets at a safe distance from the child's face and hands, the steaming being carried on for thirty minutes every three hours. The sheets should be parted slightly about every ten minutes, to allow a renewal of the air. The inhalations are to be given whether the patient is asleep or awake. As he improves, they may be given less frequently until normal respirations and the chest signs tell us this treatment is no longer required.

Counterirritants.—The application of counterirritants to the skin

over the thorax is, to my mind, of great service in cases in which there is much bronchial catarrh. This includes, of course, most cases. In order that a counterirritant may be of service, a distinct red blush must be produced on the skin. Turpentine diluted with oil,—one-third turpentine and two-thirds oil,—when briskly rubbed on the parts for a few minutes, produces a fairly satisfactory counterirritation. The old-fashioned home-made mustard plaster has also served me well. Written directions should always be given for the preparation of the plaster, and the boundaries of the area of the skin to be covered should be outlined with a pencil on the skin's surface. If the nurse or mother is told merely to put a mustard plaster on the chest, a plaster the size of a man's hand will usually be placed somewhere between the umbilicus and the chin. For the first two or three applications one part of mustard to two parts of flour is used. This is moistened with warm water and made of the consistence of a rather thin paste, which is then spread upon cheese-cloth, old muslin, or linen, cut to the desired size. The plaster is readily held in position by a bandage or any thin material extending around the chest. When the skin is well reddened—usually within from five to fifteen minutes,—the plaster is removed and vaselin or sweet oil is applied. I never use a plaster oftener than once in six hours, and then only in the severest cases. Ordinarily, two or three applications in twenty-four hours are sufficient. If the plasters are continued for several days, in order to avoid blistering it will be necessary to make them much weaker after a day or two—one part of mustard to five or ten of flour. Counterirritation is particularly effective when used at the commencement of an attack.

Mustard Baths.—In cases of sudden onset with high fever, rapid breathing, and cold extremities, a mustard bath—one tablespoonful of mustard to six gallons of water at 110° F.—will often furnish marked relief from the immediate symptoms. Autopsies on such subjects show a general congestion of the internal organs, with intense congestion of the lungs. The bath may be repeated at six-hour intervals. This type of bronchopneumonia is usually very rapid in its development, the child being relieved or dead within thirty-six to forty-eight hours. By "relieved" we do not mean that the child has recovered, but that the acute, urgent symptoms have subsided. In my opinion only these rapid cases should be considered primary.

Drugs.—The internal medication is, to a large extent, symptomatic. In any disease a great deal of harm may be done to young children by the thoughtless use of drugs. In catarrhal pneumonia it is particularly necessary that, in our endeavors to assist the patient, we do nothing to harm him, for we are treating a disease in which his powers of resistance count for everything. In young children, even in health, the digestive functions are very easily disordered. In illness with fever, with the accompanying nervous exhaustion, the stomach is most easily disturbed, the child is not properly nourished, and his powers of resistance are markedly diminished.

Expectorants must be given with care, and are better prescribed

in the form of tablets or powders. The use of heavy syrups of wild cherry, tolu, etc., with large doses of the ammonium salts, only adds to the burden of the patient. For a child one year of age with catarrhal pneumonia, $\frac{1}{100}$ grain of tartar emetic and $\frac{1}{40}$ grain of ipecac answer well as an expectorant. If the cough is very severe and persistent, ¼ grain of Dover's powder in tablet form, with sugar-of-milk dissolved in at least two teaspoonfuls of water, may be given, preferably after feeding, not oftener than once in two hours. The ammonium salts so generally used in catarrhal pneumonia for routine treatment are badly borne by the stomach. Ammonium muriate is of some value during resolution, but to a child two years old it should not be given in larger doses than ½ grain well diluted, at two-hour intervals. Personally, however, I rarely use it.

In the event of high fever and great restlessness, which are not affected by sponging, and where, for any reason, rational bathing is impossible, a combination of caffein, Dover's powder, and phenacetin may be used. For a child one year of age I would give $\frac{1}{2}$ grain of caffein, ½ grain of Dover's powder, and 1½ grains of phenacetin at about four-hour intervals. In giving Dover's powder it is well to watch the bowels, as constipation often follows its use.

Heart stimulants are usually necessary, and in their selection two points are to be considered—their effect on the heart and their effect on the stomach. But, first, what are the indications for the use of heart stimulants? Ordinarily, I think, they are used too early. A heart stimulant should never be given simply because a child has pneumonia or diphtheria or scarlet fever, but it should be given in pneumonia or diphtheria or scarlet fever as soon as the heart needs assistance. Briefly, there are two conditions to guide us—a very rapid pulse and a soft, not rapid, pulse, with a tendency to irregularity. In a general way, I believe that a heart which is beating at the rate of 150 a minute during quiet or sleep, and which is not strengthened by sponging or packs, needs assistance. The drug which has served me best is tincture of strophanthus, which acts as a direct stimulant to the heart muscle. The pulse, by its use, is made stronger, fuller, and less rapid. When the heart's action shows a tendency to irregularity, with a soft, easily compressible pulse, then strychnin is the remedy. Caffein sodiosalicylate in ½-grain doses every two hours is also of much use in such a condition. For a child one year of age one drop of strophanthus in water may be given every three hours, or $\frac{1}{300}$ grain of strychnin every three hours, to be increased to $\frac{1}{200}$ or even to $\frac{1}{100}$ grain every three hours for a few doses, if the case is carefully watched for symptoms of strychnin poisoning. Strophanthus and strychnin possess advantages over all other stimulants in that they do their work and have no unpleasant effect on the stomach, as is the case with alcohol, digitalis, and the ammonium preparations. If the condition is very urgent, strophanthus and strychnin may be used in combination. I rarely employ digitalis because of its tendency to interfere with digestion. Alcohol in the form of whisky or brandy is very rarely of great service in catarrhal pneumonia.

It may stimulate the heart, but its prolonged use greatly upsets the stomach. It should be withheld until late in the disease, when other means of stimulation fail. Then, given in large amounts, it may be the means of saving the patient. One-half dram of whisky or brandy, well diluted, may be given every hour or every two hours to a child one year of age. However, the cases of catarrhal pneumonia actually saved by the use of alcohol are few indeed. Nitroglycerin, $\frac{1}{300}$ grain every three hours for a child one year of age, is of service in cases where there is marked cyanosis with cold extremities. Its use should be discontinued as soon as improvement in this respect is noticed. The one unpleasant feature that I have observed from its administration is its tendency to produce headache and marked restlessness.

Hypodermic Medication.—In all urgent cases in which collapse is threatened, or when stomach medication does not give results desired, I employ the hypodermic, using the same dosage as given by the mouth. Camphor may be given in two-grain doses and repeated hourly if necessary. Digitalin, $\frac{1}{200}$ grain, may be given and repeated in three or four hours. For urgent collapse, camphor and 1:1000 solution of adrenalin, 3 to 5 minims, are our best stimulants.

Baths.—A sponge-bath at 95° F. for cleansing purposes may be given daily.

Pyrexia.—What is to be our guide in dealing with the pyrexia? At what degree of temperature are we to interfere? This depends to a great extent upon what is behind the fever and the effect of the fever upon the individual patient. If a child has a high fever and is more comfortable when it is reduced, if he will digest his food better and sleep better, our duty is to reduce temperature. Further, by reducing it we lessen the work of the heart, saving many beats per minute. Usually, when the rectal temperature has a tendency to run above 104° F., interference is of advantage, and the best means at our command is the use of local applications of water in the form of sponge-baths or packs. If the temperature is easily controlled, a sponge-bath will answer our purpose. Either salt or alcohol may be added to the water. Ordinarily, two teaspoonfuls of salt to a quart of water, or one part alcohol to three parts water, is ample. Cold water thus used serves two purposes—it acts as a sedative and it reduces the fever. *Cold sponging,* while not as effectual as a bath or a pack, possesses the advantage of being applicable even in the hands of the most unskilled. For sponging, the child should be stripped and covered with a flannel blanket, the sponging being done under the blanket. In order not to antagonize or frighten him, it is best to begin with the water at 95° F. and gradually to reduce the temperature to 70° or 75° F. by the addition of ice or cold water. The sponging may be continued from ten to twenty minutes, and should not be repeated at shorter intervals than ninety minutes. After the sponging is completed the skin should be rubbed briskly for a few minutes with a dry towel. If the temperature is not readily controlled in this way, it is best to use other means, as too frequent sponging exhausts the patient. As a means of controlling the temperature in children, the

tub-bath has not been successful in my hands, for the reason that I have not been able by this means to control the fever. The exposure, the fright, and the necessary shortness of the bath render it very unsatisfactory.

By far the best means at our command for controlling a continued high fever is the *cold pack* (p. 747). Properly applied, it is without the slightest danger. A large bath-towel or any thick absorbent material may be used, slits being cut in one end of the towel through which the arms may pass. The towel should be folded over the body, and should extend from the neck to the middle of the thighs, the arms and the legs from the knees down remaining free. A hot-water bag, carefully guarded, should be placed at the feet. The towel is moistened with water at 95° F. It is well to make the pack warm at first, so that the child will not be frightened, as shock will thus be avoided. I have known severe shock to occur when a child with a temperature of 105° F. was put suddenly into a pack at 70° F. In two or three minutes the towel is moistened with water at 85° F., then at 80° F. When 80° F. is reached, it is best not to make the water any colder for half an hour, at which time the temperature of the patient is taken. If, in the beginning, it is 105° F. and at the expiration of the half-hour shows slight or no reduction, the temperature of the pack may be reduced to 70° or even to 60° F., by the addition of cold water or ice, without removing the child, who is turned from side to side so that all parts of the enveloping towel may be moistened with cool water. During the first hours in the pack the temperature should be taken every half-hour, and when it is reduced to 102° F., the child should be removed and wrapped in a warm blanket. In cases of sudden and persistent high fever the child may be kept in the pack continuously. We aim to keep the temperature between 102.5° and 103.5° F. A fresh towel should be applied every three hours. An ice-bag should be kept at the head, a hot-water bag at the feet, and the patient should be covered with a flannel blanket of medium weight. The degree of cold necessary to control the fever in a given case will soon be learned. I recently kept in a pack for seventy-two hours a four-year-old boy ill with lobar pneumonia. In this case a pack at 70° F. was necessary to keep the temperature at 104° F. or slightly lower.

Oxygen.—Oxygen is of immense service in very severe cases with much lung involvement. It may be given continuously for one or two minutes out of every seven or ten. As often given, for one or two minutes every half-hour, it is of little or no service.

INTERSTITIAL PNEUMONIA, INCLUDING BRONCHIECTASIS

Interstitial pneumonia occurs in two types of cases. After bronchopneumonia the interstitial variety represents an unresolved pneumonia, and usually means that the individual has had more than one attack. The great majority of such cases are seen in ill-conditioned infants in hospitals and institutional homes. Rarely is this type seen in older children. I have seen but six cases in children over four years of age.

The second type represents the cases of unresolved pneumonia,

usually lobar pneumonia, which have been complicated by empyema, and in which the empyema has not been recognized or has been improperly treated.

Pathology.—Chronic interstitial pneumonia is a productive inflammation characterized by thickening of the connective-tissue framework of the lung. This disease follows one or more attacks of bronchopneumonia or may accompany a chronic empyema. The process may involve one or more lobes of the lung, or only a portion of one lobe. The involved lung is usually adherent to the chest-wall by very dense fibrous adhesions, and is smaller than normal, firm, and grayish in color. On section, the pleura and connective-tissue septa are found to be greatly thickened. The bronchi are often dilated, and may be the seat of purulent bronchitis.

Microscopic examination shows that the interlobular septa, the bronchi, the blood-vessels, and the alveolar walls are thickened with connective tissue. As a consequence the alveoli are compressed and empty, or they may be filled with connective-tissue plugs as the result of the so-called organization of an unresolved pneumonic exudate.

Compensatory emphysema is often present in a portion of the unaffected lung.

Symptoms.—Not half the symptoms described by writers exist. The principal manifestation is afforded by the condition of the patient, who is anemic, emaciated, and fails to thrive, or improves but slowly even under the best surroundings.

There may be cough and, rarely, fever. The respiration is accelerated upon exertion, but otherwise shows no change. If there is an associated bronchiectasis, in older patients, there will be mucopurulent or purulent expectoration.

A boy who was under my care for several years expelled free expectoration about once a day. There was an interstitial pneumonia involving the lower half of the right lung, which was the seat of one or more bronchiectatic cavities. The pus evidently collected periodically and filled the cavity, then irritation would be excited, producing cough and emptying of the cavity.

Diagnosis.—There may be extensive retraction of the chest-wall or none at all, depending on the age of the patient; in infants under eighteen months there is rarely such retraction.

Upon forced inspiration, as in crying, it will be noticed that the chest-wall over the involved lung area fails to take part in the normal respiratory excursion. In the cases of older children there are varying degrees of retraction, usually associated with spinal curvature.

Auscultation.—The respiratory signs are subject to wide variations. Thus in one case there may be bronchial breathing over one diseased area and entire absence of the respiratory murmur over another area. Between these extremes in the same case there may be every variety of abnormal respiratory sounds. Over the uninvolved lung the respiratory murmur undergoes pronounced exaggeration. If there is a con-

siderable bronchiectasis, signs of a cavity will be indicated by amphoric breathing.

Percussion.—Percussion invariably shows localized dulness over the diseased portion of the lung. One may find all shades of dulness to flatness. Over the free portion of the lung, hyperresonance will be found because of the emphysema, which is always present in slight or moderate degree.

Differential Diagnosis.—The question that always arises in these cases relates to the possibility of tuberculosis. A considerable number, particularly of the young, do develop tuberculosis. An examination of the sputum and the von Pirquet tuberculosis test should invariably be made. In cases in young infants a positive von Pirquet reaction supplies reliable corroborative evidence. Repeated examination of the bronchial secretions (p. 358) will reveal the tubercle bacillus if it is present. In the cases of older children examination of the sputum quickly determines the diagnosis.

Prognosis.—The prognosis in infants is very unfavorable. If tuberculosis does not develop, intercurrent diseases, such as the intestinal diseases of summer, whooping-cough, measles, or further acute pneumonia, will very likely terminate the case. Recovery is not impossible, however, and I have known infants to make almost complete recoveries after the process had existed for months. In one case the child's chest did not begin to "clear" until after the third month. In recovery cases the interstitial change could not have been at all extensive. In older children, after the sixth year, recoveries as regards life are the rule. Whether the case follows a bronchopneumonia or a pneumonia with empyema, even with the best results, there will be left a more or less crippled lung, which does not necessarily compromise the later well-being of the patient. Such patients, however, are more liable to tuberculous infection, and this possibility is always to be taken into consideration in their management.

Bronchiectasis.—Bronchiectasis is present in a considerable number of these cases, both in the young and older children. It consists of dilatation of the bronchi, such dilatation being usually sacculated or cylindric in form. The lungs of a child eighteen months of age who died from bronchopneumonia of three months' duration, with terminal sepsis, presented several small cylindric dilatations. One of these, with a capacity of six drams, was found in the right lung. This case is similar to many seen at autopsy. In young infants bronchiectasis may be very difficult of demonstration. In the cases of older patients the expectoration of pus in a chronic pneumonia is very suggestive, and in such instances physical examination may reveal amphoric breathing and other signs of cavity.

Dilatation of a bronchus may be cylindric, sacculated, or spindle-shaped. It is accompanied either by atrophy or by hypertrophy of the mucosa and of the entire bronchial wall. Dilated bronchi contain thick mucous or purulent secretion, often in very large amount. The secretion may be blood-stained, due to rupture of some of the very

numerous blood-vessels in the hypertrophied mucosa. Pressure of the dilated bronchi often causes collapse of the pulmonary alveoli surrounding them. The walls of neighboring bronchi may fuse, forming larger cavities.

Treatment.—The treatment of interstitial pneumonia is not particularly brilliant in results. There is always the hope that the interstitial process dependent on cicatricial change is not extensive, for this feature determines in no little degree the outcome of the case. When resolution takes place, it occurs always from the periphery toward the center of the diseased part. The involved area becomes smaller and smaller and disappears, or, more frequently, as the ultimate outcome, an area of weakly vesicular breathing remains to mark the site where the disease was most active.

Little can be accomplished by the use of drugs except to improve the nutrition of the patient. Children with this unfortunate pulmonary disease should take up their permanent residence in a dry climate, such as is furnished by Colorado or New Mexico. A visit of a few months or a year is of but little service. I have used the iodids and the bichlorid of mercury for months without any appreciable improvement in two of these patients who could not be removed from town. The citrate of iron and quinin, one grain in a dram of sherry wine, makes a good appetizer, and may be given in one-fourth glass of water after meals. Its use can with advantage be alternated with that of the syrup of the hypophosphites (Gardner), one to three drams being given daily in one-half glass of water after meals. Cod-liver oil may be used with advantage for ten days out of the month, but its continued use is contraindicated, as it is apt to interfere with digestion.

In one of the cases above referred to the iron was given for ten days and the oil for ten days, after which the procedure was steadily repeated. The patient continued to look well, gained in weight, and remained under treatment until he took up an occupation and passed from observation. The condition of the lung had remained unchanged, the only active manifestation of the disease being the expectoration of a considerable amount of non-tuberculous pus every morning on rising.

Infants and children with bronchiectasis who cannot be removed to a favorable climate should have the advantages of outdoor life, and older children should have as much active exercise as is possible without fatigue. The diet and general management are the same as for pulmonary tuberculosis (p. 357).

Gymnastic Therapeutics.—For the purpose of expansion of the lung with the hope of curing the chest deformity gymnastic exercises are of the greatest value. (See p. 771.)

HYPOSTATIC PNEUMONIA

Hypostatic pneumonia is a form of lobular pneumonia which develops in fatal cases in the most dependent portions of the lungs, these portions having become very hyperemic as the result of weakness of the heart and respiration in patients who are severely ill.

The affected pulmonary tissue is dark red in color, very firm, and airless. On section, the cut surface is red and very moist, exuding blood freely. Microscopically, the capillaries and veins are distended with blood, and the alveoli are filled with red blood-cells, leukocytes, and desquamated epithelium. The bronchi are usually in good condition. The extent of the consolidation varies. While it usually occupies only a superficial strip along the posterior border and base of the lungs, fully half of the lower lobes may be involved.

PNEUMOTHORAX

Air in the pleural cavity may be due to tuberculosis, or to trauma (usually through exploratory puncture), causing perforation of the lung. I have seen one case of this nature. Pneumothorax also may occur in empyema. By far the most frequent cause in children is the formation of a cavity in the course of tuberculosis, supplying a communication between the bronchi and the pleural cavity.

Symptoms.—In the tuberculous cases the symptoms comprise very sudden onset of urgent collapse, urgent dyspnea, cyanosis, and rapid, feeble pulse. In cases due to trauma the symptoms may be urgent or scarcely noticeable, depending upon the extent of the lesion. In the case referred to, which developed after exploratory puncture, only a moderate amount of air entered the pleural cavity and no inconvenience was occasioned.

Physical Signs.—The physical signs are determined largely by the amount of air entering the pleural cavity. They may include simply hyperresonance and absence of respiratory sounds. In cases of tuberculous origin there is usually a sudden inrush of air, with resulting immobility of the affected side and enlargement of that side of the thorax. There is marked hyperresonance, and an absence of fremitus. In cases in which the amount of air is not excessive there will be tympanitic dulness.

Auscultation reveals very weak breath-sounds or entire absence of the same. The coin test is very diagnostic. A coin is placed on the chest, either anteriorly or posteriorly, and tapped with another coin by an assistant, while the ear of the examiner is placed on the opposite aspect of the same half of the chest. The sharp metallic sound conveyed, in comparison with the absence of sound over the opposite lung, furnishes a demonstration to students that will never be forgotten. If there is fluid in the pleural cavity, splashing, metallic, tinkling sounds may be heard.

Prognosis.—The prognosis depends upon the cause of the air in the pleural cavity. The tuberculous cases are rapidly fatal. After trauma the recovery depends upon the nature of the injury. In the case referred to as following exploratory puncture, the patient recovered without treatment.

Treatment.—In empyema the fluid should be removed by surgical procedures. In instances in which there are marked displacement of the heart and considerable intrathoracic pressure, tapping the chest with a needle, and allowing an escape of the air, may be of value.

EMPHYSEMA

Emphysema is a secondary disease. There are few autopsies on children dying from pulmonary disorders in which it is not found present in greater or less degree. It is always present in considerable degree in cases of interstitial pneumonia, and in this association the emphysema is compensatory in character. It is found with whooping-cough, bronchopneumonia, habitual spasmodic bronchitis, and true asthma.

Pathology.—Emphysema is most frequently found in a pronounced degree in the upper lobes, especially at the anterior borders and the apices. The air-vesicles are persistently dilated, and on inspection, to the unaided eye, present a picture of innumerable pin-point air-bubbles. When the septa give way, the vesicles enlarge so that blebs of various size occur. The condition rarely becomes interlobular.

Symptoms.—In many cases there is no special manifestation, and the fact that emphysema exists is discovered only at the autopsy. This is particularly apt to occur in compensating cases in which there is a good deal of lung involvement, as in interstitial pneumonia or in prolonged bronchopneumonia.

When there has been repeated spasmodic bronchitis or true asthma, there is shortness of the breath, with rapid breathing, and the thoracic wall presents a fixed appearance, owing to the diminished or imperceptible respiratory excursion.

The so-called barrel-shaped chest is seen in children, but it is of comparatively infrequent occurrence. The child usually has a dry cough, is incapable of the usual exertions of early life, and readily becomes cyanosed through air-hunger.

Percussion.—There is increased resonance on percussion, general in distribution, but most marked over the upper lobes in front. When the emphysema is not excessive, tympanitic dulness may be elicited. The area of cardiac dulness may be much smaller than normal or entirely obliterated.

Auscultation.—Upon auscultation the respiratory murmur is found to be feeble, and expiration is noticeably prolonged and longer than inspiration. Squeaking, small, dry râles are usually heard in children because of the almost invariable association of bronchitis. The râles are heard both on inspiration and on expiration. The respiratory sounds have been aptly described as wheezing in character.

Prognosis.—The prognosis in general emphysema is unfavorable. The attacks of recurrent asthma or recurrent spasmodic bronchitis, which occasion the process, continue, and the condition becomes most pitiable. Dilatation of the right heart ultimately occurs. Cardiac failure and acute pulmonary processes are the usual terminal affections.

Treatment.—The management is that of the associated disease.

SUBCUTANEOUS EMPHYSEMA (EMPHYSEMA OF THE MEDIASTINUM)

This is a rare condition in children. I have seen but a few cases. Before the use of intubation, when tracheotomy was in vogue, many

more cases were seen than now. Other causes may be pertussis, tuberculosis, or trauma to the lung. The first occurrence is in the mediastinum, whence the emphysema extends to the subcutaneous tissues and is particularly apt to appear above the clavicles, where it produces a cushion-like effect. In one of my cases the emphysema extended from this point downward over the thorax, and upward, involving the entire neck.

Prognosis.—Cases following operative procedures and trauma may recover. When the condition is a complication of pulmonary disease, the outlook is very unfavorable.

PRIMARY PLEURISY

Acute, primary pleurisy is a very rare condition in children. I have seen but five cases under nine years of age—one patient was eight; one, seven; one, four years of age; one, two and a half years; and one, only fifteen months old.

Pathology.—In these cases there is inflammation of the pleura with exudate, but usually not sufficient inflammation to produce an appreciable exudate in the pleural cavity.

Symptoms.—The onset of the disease is practically the same as in adults. There is localized pain—the so-called "stitch in the side"; the respiration is rapid—40 to 60 to the minute—and shallow; the skin is dry and hot; the cough is teasing, and, on account of the pain which it causes, is partially suppressed by the patient. Fever is present, usually ranging from 102° to 105° F. The pulse is rapid—120 to 150 to the minute. In two of my cases the pleuritic inflammation was followed by effusion. The fluid in both cases was sterile. So far as we could learn, there was no associated rheumatism in any of the cases.

Treatment.—The treatment which proved successful in the five cases was rest in bed. The patients were given a reduced diet of milk, broths, and gruel. The fever was not of a very persistent character and was readily controlled by sponge-baths (p. 749). A flaxseed and mustard poultice,—one part of mustard to nine parts of flaxseed,—applied as hot as could be borne by the back of the nurse's hand and changed every half-hour, gave much relief from the pain during the acute stage. After the first twenty-four hours, however, poultices are of little value. Strapping the affected side with strips of Z. O. plaster will give much comfort when the pain continues after the second day. Tincture of aconite in doses of one drop every hour was given to the older children until ten drops had been given. It produced a fairly free diaphoresis and made the patients more comfortable. A grain of calomel in divided doses was given early in the attack, $\frac{1}{10}$ grain being given every hour. The duration of the acute symptoms was ordinarily from twelve to twenty-four hours, the entire duration of the illness ranging from five days to one week. In the case of effusion in the youngest child, absorption appeared to be stimulated by the introduction of the needle and the withdrawal of a small amount of fluid, the remainder quickly disappearing afterward. To relieve the cough, small doses of codein, $\frac{1}{10}$ grain every two hours, were given the older children.

Ultimate Results.—That these cases were not of tuberculous origin was proved, not only by the absence of the tubercle bacilli, but by the complete recovery and continued good health of each patient during the next few years.

SECONDARY PLEURISY

This form of pleurisy is of very frequent occurrence in the young.

Etiology.—In by far the larger number of cases, pleurisy occurs as a complication of pneumonia.

Tuberculosis is probably the next most frequent cause.

Secondary pleurisy may occur with pericarditis; such an association, however, is extremely rare.

Bacteriology.—Acute fibrinous (dry) pleurisy accompanying pneumonia in children is caused by the identical bacterium found in the consolidated areas of lung tissue. This type of pleurisy is more common with lobar pneumonia than with bronchopneumonia.

In acute serous pleurisy accompanying pneumonia small numbers of pneumococci may be found in the fluid. Clear, serous, pleural fluid containing streptococci has been described.

In the tuberculous cases the fluid contains the tubercle bacillus, demonstrable by staining methods or by intraperitoneal injection into guinea-pigs. On ordinary culture-media tuberculous serous fluids give no growth. Pleurisy with serous effusion may occur with acute rheumatism. The Poynton-Payne diplococcus of rheumatism has been found in the fluid of such cases.

Pathology.—Following or coincident with pneumonia there may occur what is known as a dry pleurisy, or pleurisy with effusion. When dry pleurisy exists, the pleura loses its usual luster, and, early in the attack, is covered with a slight fibrinous exudate. Exudation may go no further than this, or it may become most extensive, resulting in a network of thick, fibrinous bands, in the meshes of which there is a thick, gelatinous mass composed largely of fibrin and pus-cells.

Repeatedly at autopsy I have found the lung so thoroughly bound to the chest-wall that its removal without the aid of force was impossible.

In *pleurisy with effusion* a fluid composed either of pus or of serum will be found in the pleural cavity. I have never seen such a case of pleurisy secondary to pneumonia in which the effusion did not contain bacteria. The fluid upon withdrawal may appear clear, yet bacteriologic examination will show that it is not sterile. The evidence of bacteria in the fluid may be, and often is, the first manifestation of a purulent pleurisy or empyema.

Pleurisy of tuberculous origin is usually of the dry type. Tubercles will be found on the pleura, and there is more or less exudation of fibrin. If the process is an old one, there is considerable thickening of the pleura, with very firm adhesions. If there is a fluid, it usually exists in small amount,—1 to 4 ounces,—sacculated, and may be serous or purulent.

Symptoms.—Secondary pleurisy rarely exhibits distinct symptoms of its own. The manifestations are a part of the disease which the pleurisy complicates. There may be localized pain, but this is rarely of an active type. A sensation of tightness or constriction is more common. It is surprising how little discomfort is present in a vast majority of these cases. When fluid is formed, whether serum or pus, there are, again, no active symptoms unless the fluid is excessive, in which event there will be interference with respiration, and, if the process is on the left side, the heart will show the effects of the pressure by rapidity and perhaps irregularity.

The influence that the pleurisy exerts upon the temperature is difficult to determine, as the process is secondary to diseases in which temperature is a prominent feature. If the exudation is purulent, the temperature may take on the characteristic morning drop and evening rise. This will be very apt to occur in case of purulent exudation following pneumonia, which is discussed in the following chapter under Empyema.

Diagnosis.—The diagnosis is dependent more upon the physical signs than upon the symptoms.

Auscultation.—In the cases without fluid exudate auscultation will often show either fine friction râles, which may be heard only at the end of inspiration, or the dry-rubbing friction crepitus heard with both inspiration and expiration. In the presence of fluid there will be weakness of, or absence of, respiratory murmur over the area covered by the exuded fluid. Râles also will be absent. Over the uninvolved lung area there will be an exaggeration of the normal respiratory sounds.

Percussion.—In dry pleurisy there is no perceptible dulness; the child may complain that the percussion is painful. With fluid there will be dulness or flatness, depending upon the amount of fluid present. A small amount usually gives circumscribed dulness; a large amount, extreme dulness or flatness. Over the uninvolved portion of the lung there will be hyperresonance.

Exploratory Puncture.—Exploratory puncture not only definitely determines the presence of fluid, but also its nature.

Treatment.—The treatment of dry secondary pleurisy is usually that of the disease which the pleurisy complicates. I have never known special medication to be of any practical value. Tonics and supportive measures generally are of service. Anything that will improve the condition of the patient should be brought into use. A change of residence from the city to the country for those who can afford it, or an outdoor life in the city for those who cannot avail themselves of such a change, is always beneficial. Counterirritation to the chest with mustard or iodin will often give relief to the patient if there is pain, but otherwise this measure possesses no value. When there is a sense of "tightness" and constriction of the chest which amounts to pain, mustard or iodin will relieve the discomfort. Painting the affected area with tincture of iodin every second or third night has, in a few cases, afforded some relief. The administration of iodids as an aid to absorp-

tion is of questionable value, and is very apt to disturb the digestion. The application of a mustard plaster (p. 309)—one-third mustard and two-thirds flour—to the bare skin over the diseased area for ten or fifteen minutes, at intervals of six or eight hours, will add to the comfort of the patient. When, after recovery from the pneumonia or the empyema, adhesions persist, compelling restricted lung action, active exercise in the open air is to be encouraged. For younger patients horseback-riding, the bicycle, and breathing exercises, with physical games which call for active interest and require deep breathing, do better than anything else.

Presence of Fluid.—If the exploratory puncture shows the presence of serum, the fluid is best left, with the hope that it will be absorbed, unless it is in sufficient amount to compromise the respiratory function and the action of the heart. In such an event, several ounces should be removed by aspiration. In many cases the fluid has rapidly disappeared after one aspiration. The aspiration may be repeated if necessary. During this operation care should be exercised to observe absolute asepsis. I have known cases to become rapidly purulent after the insertion of a needle. There is always a question in such instances, how much infection has been carried in on the needle.

Preparation of the Skin for an Aspiration.—The skin should be thoroughly scrubbed with green soap. This is to be followed by washing with alcohol, and then with equal parts of alcohol and tincture of iodin. The hands should be cleaned, and the instrument used should be sterilized, as for a surgical operation.

If the pleurisy is of tuberculous origin, no particular management is carried out other than that of the primary disease, except in the event of symptoms of pain. This is to be relieved, as already described, by the use of local applications of mustard and iodin, with perhaps the administration of a sedative, such as small doses of codein.

Dry pleurisy associated with pericarditis does not call for treatment other than that of the pericarditis, excepting in instances which call for the relief of pain.

EMPYEMA (PLEURISY WITH PURULENT EFFUSION)

In empyema there is a collection of pus in the pleural cavity, resulting from inflammation of the pleura which has become infected with pathogenic organisms.

Age.—A vast majority of the cases occur in infants and children under four years of age. My youngest patient was three weeks old, and this child recovered. Comparatively few cases develop after the tenth year.

Etiology.—In 95 per cent. of my cases the disease has occurred with evident pneumonia. Empyema may follow suppurative processes in any part of the body, but such cases are extremely rare.

Bacteriology.—The pneumococcus is found in pure culture in the pus in about 75 per cent. of all cases in children. The streptococcus is less commonly present, and the Staphylococcus aureus is very rarely found.

B. influenzæ has been found in pure culture in purulent pleural fluid after influenzal pneumonia, and B. typhosus may cause empyema during an attack of typhoid fever. In cases of empyema following inflammatory conditions in the abdomen (appendicitis or peritonitis) B. coli communis has been isolated.

Purulent effusion accompanying pulmonary tuberculosis may contain the tubercle bacillus, but pyogenic cocci also are almost always present.

Pathology.—A purulent pleural exudation may follow serous inflammation of the pleura, or the process may be a purulent one from the outset. The pus may be thin or thick, yellowish or greenish in color, and it may contain large masses of fibrin. The quantity of purulent fluid may vary from a few ounces to 30 to 40 ounces or more in neglected cases. While the inflammation may involve the entire pleural surface of one lung, it is more often limited to the lower lobe and to the posterior portion. Both pleural cavities may be involved. The pulmonary and costal surfaces of the pleura are usually covered with a fibrinopurulent exudate, and adhesions between the pleural surfaces and between the pleura and pericardium are readily separated at this stage. The lung substance beneath the exudate is more or less compressed, according to the amount of pus present. In extreme cases the affected lung portion may be completely airless, bloodless, gray in color, smaller than normal, and flattened against the vertebral column. The heart may be pressed toward the healthy side. In less severe cases the lung may be congested, and still contain some air.

Empyema may heal completely in the early stage. Very often, however, it tends toward a chronic course. The pus frequently becomes very thick, and the formation of granulation tissue, and later of fibrous connective tissue, causes irregular thickening of the pleura. Adhesions between the pleural surfaces may thus be so dense as to make separation impossible, and an encapsulated empyema may be formed by the shutting off of a smaller or larger amount of pus by adhesions. The connective-tissue formation may even extend into the lung substance, resulting in interstitial pneumonia.

In cases of empyema which come to autopsy early in the disease the pneumonia preceding the empyema may still be present. In later stages, however, only a complicating bronchopneumonia, acute or chronic, may be found in one or more of the lobes not involved by the empyema, or an interstitial pneumonia in that portion of the lung substance beneath the thickened pleura.

In untreated cases the pus may be evacuated through a bronchus, externally through the chest-wall, or into the peritoneal cavity.

Symptoms.—The child has a catarrhal pneumonia or a bronchopneumonia, running the usual course as to fever, respiration, pulse, and prostration. After a time varying from six to twelve days an improvement in the symptoms is noticed, the pulse and respiration become slower, and the child appears brighter. For twenty-four to forty-eight hours the temperature range is quite low. During the height of the

pneumonia it has been perhaps 104° F. to 105° F. Now the temperature ranges from 100° F. to 102° F., at times dropping to 99° F. Soon it becomes noticeable that the temperature is higher in the evening than in the morning, although the evening temperature may not be above 102° F., or at most 103° F. The child coughs, the pulse is rapid,—120 to 140,—and the respiration is accelerated to 40 or more. The appetite is poor. These or similar symptoms may continue for weeks if the condition is not recognized.

Empyema After Lobar Pneumonia.—More cases of empyema follow lobar pneumonia than the catarrhal type. The following symptomatology covers a majority of the cases: The crisis occurs, and the temperature falls to normal (see Fig. 44) and remains normal for a few days; or perhaps there is the temporary postcritical rise the day following the

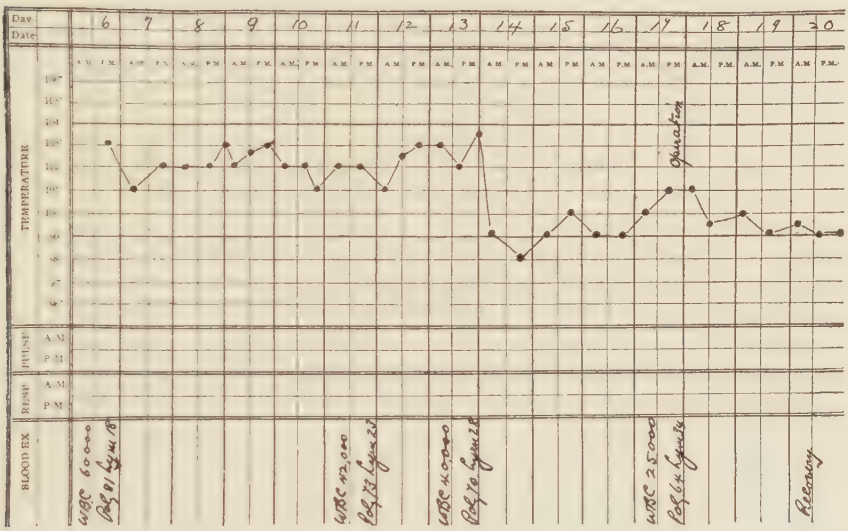


Fig. 44.—Temperature chart. Empyema following lobar pneumonia.

crisis. In other respects conditions continue favorable for perhaps two, three, or rarely five days, when a slight evening rise in temperature occurs. The temperature is lower the next morning, but perhaps not quite normal; the following evening it is higher than the preceding, and the next evening it is still higher. Such a temperature range following pneumonia is almost pathognomonic of empyema (Fig. 45).

In some few cases the exudation of pus into the pleural cavity is not delayed until the temperature falls, but develops during the first few days of the pneumonia. With the formation of pus the respiration and pulse increase in frequency, the respiration ranging above 40, and the pulse from 140 to 180. It is a mistake, however, invariably to expect characteristic signs. The lungs and heart soon accommodate themselves to the changed conditions. Repeatedly I have seen cases in

which there was but slight acceleration of the pulse and respiration. The evening temperature, however, is rarely less than 102° F. In addition to the symptoms enumerated, these cases (particularly those that have continued for two weeks or longer) show a symptom-complex that may almost be said to be characteristic. The child is emaciated and the face wears an anxious expression. The skin is pale, of a yellowish tinge, and perspires readily. The mucous membrane and conjunctivæ are pale. Slight exertion causes embarrassment of the respiration. The nostrils are distended; the respiration during rest is short, and increased from 10 to 20 per minute above the normal. The fingers may show signs of clubbing.

Diagnosis.—Diagnosis is based upon physical examination of the chest and exploratory puncture. Weakness or absence of respiratory

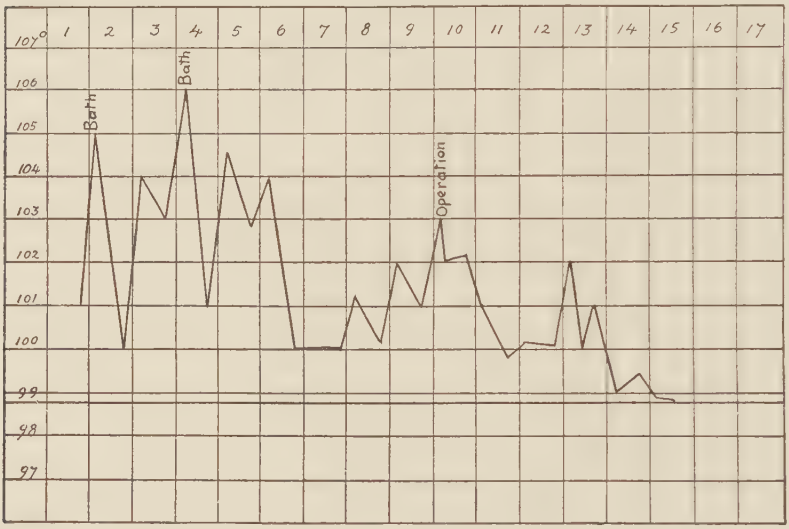


Fig. 45.—Empyema following lobar pneumonia. Operation. Recovery case.

murmur and absence of râles, combined with the presence of dulness or flatness, are indications justifying an exploratory puncture.

When the disease is located on the left side, the displacement of the heart to the right, as indicated by the changed position of the apex-beat, is a very suggestive sign. Over the uninvolved portion of the chest, auscultation will show exaggerated respiratory murmur; and percussion, hyperresonance.

Differential Diagnosis.—(Blood examination, p. 392.) Empyema is to be differentiated from serous pleurisy, pleurisy with massive exudation of fibrin, unresolved pneumonia, pulmonary tuberculosis, malaria, and typhoid fever.

Serous pleurisy and pleurisy with a thick, fibrinous exudate give signs identical with those of empyema. In many cases of fibrinous

pleurisy with a considerable exudate, not a râle or friction-sound will be heard. Our only means of differentiating empyema from these processes is in an exploratory puncture with a large needle.

In unresolved pneumonia the respiratory sounds are heard with greater distinction. Râles and, often, friction-sounds are present. The dulness is distinctly localized, and there is rarely flatness unless there is associated with the pneumonia a thick pleuritic exudate.

In tuberculosis of the lung of sufficient gravity to allow of confusion the presence of tubercle bacilli in smears from the expectoration or tracheal secretion (see p. 358) may determine the diagnosis. The von Pirquet test (p. 679) may be brought into use. Here also, however, the exploratory puncture is the best means of establishing the diagnosis.

The difficulties in differentiating typhoid fever and malaria from empyema should be slight, in view of the marked dissimilarity in the disease conditions. Nevertheless, cases of empyema are not infrequently treated for typhoid and malaria when pus is apparent in the pleural cavity. When the lungs are proved normal by competent physical examination, then the tests for malaria and typhoid in daily use may be instituted.

Treatment.—When pus is located, operation and drainage are the only method of treatment. Aspiration is never to be looked upon as a substitute for incision.

In a recent case in a young child under two years of age an incision with local anesthesia—ethyl chlorid answers the purpose—is all that will be required. In the case of an older child, or in a prolonged case in a young child, a resection of the rib is to be advised as furnishing much freer drainage. Occasionally cases are seen among older children in which, on account of a very severe, persisting pneumonia, it will not be safe to use a general anesthetic. In such cases an incision may be made under cocain—a 4 per cent. solution being injected into the skin at the site of the proposed incision. Such an operation will relieve the immediate symptoms—the displacement of the heart and the difficult breathing. The resection of a rib may safely be undertaken after a week or two, when considerable improvement will have taken place in the general condition. As soon as the cavity is opened, two half-inch drainage-tubes, from two to four inches in length, joined with a large safety-pin, are inserted. Gauze is packed around the tubes and against the skin, and upon this the pin rests. Sterile gauze is placed over the end of the tubes as soon as possible after their introduction, in order to prevent too free escape of pus. When the pus is allowed gradually to escape, much less shock will be experienced. Over the gauze, two or three layers of absorbent cotton are placed, and over this the bandage. The dressing should be changed every day and the tubes shortened as the lung expands. This expansion will be indicated by the resulting outward displacement of the tubes. After the evacuation of the pus the pulse usually falls to normal or nearly normal, where it remains. Occasionally, however, cases are seen in which this expected result does not follow the operation.

Illustrative Case.—In one of my cases the operation was followed by a free discharge of pus, but with no relief whatever to the symptoms. An examination of the chest revealed at the apex of the lung a pocket of pus which had become walled off by adhesions. The case was one of three months' duration when it came under my care. A second operation removed about six ounces of pus, but the child died from exhaustion about twenty-four hours afterward. Autopsy showed that the pleural cavity was divided into two distinct pus-sacs by a firm band of adhesions.

Failure of the temperature to subside in my cases in which complications could be excluded has been due to defective drainage. The tube may be too small or plugged, or the pus may become sacculated. Large fibrinous masses which the tube will not admit may undergo slow degeneration and absorption and continue the temperature.

Illustrative Case.—In a case of empyema following a pneumonia of great severity in a girl of five years, on account of the reduced condition of the child an incision was made instead of a resection of the rib. The temperature fell to normal, and all the symptoms improved for a few days, when an evening rise to 101° F. and over was noted, which in two or three days reached 103° F. There was a discharge which saturated the dressings, although they were changed every three or four hours. Our inability to locate an independent pus-pocket, the continued fever, and a strong odor to the discharge suggested the probability of insufficient drainage. In spite of the fever, the child having gained considerably in strength, a second operation was decided upon to enlarge the wound. She was anesthetized, and two inches of rib were removed, whereupon quantities of necrotic fibrinous material were found in the pleural cavity. These were removed with the finger and dressing forceps; the temperature immediately fell to normal, and the child made a perfect recovery. Irrigation of the cavity had been of no avail.

Ordinarily the tubes should not be removed until from four to six weeks after the operation. At least one tube should be kept in position until a free respiratory murmur is heard all over the affected side, up to the site of operation in the chest-wall. When the lung is fully expanded, the tubes will be forced out and found in the dressings. Irrigation of the pleural cavity is not to be advised as a routine measure, and with sufficient drainage it will not be found necessary. The cases which require irrigation on account of continued fever and insufficient discharge require a resection of the rib. Should a second operation be refused, on account of the tender age or the general weakness of the patient, or be inadvisable on account of some complication, such as a pericarditis, a daily irrigation with a sterile normal salt solution may be undertaken.

Deformity Following Untreated Cases.—In hospital and out-patient work, cases neglected for weeks, showing marked chest deformity and retraction, usually associated with spinal curvature, are among those treated. The pus has been partially absorbed and partially organized, leaving extensive adhesions which have bound the lung tightly to the chest-wall, preventing expansion, so that the bony wall has become displaced inward to meet the lung. For these unfortunate children surgical measures furnish some relief, but the results in my cases have not been brilliant.

Treatment by Siphon Drainage.—The siphon drainage, often named after Bulan, but previously used by Playfair, has, during the past two years, been considerably modified and made more efficient by Kenyon, of New York. His modification has been almost exclusively used at the Babies' Hospital with extremely gratifying results, and

has been efficient in treating infants as young as two months of age. For detailed description see "Siphon Treatment of Empyema in Infants," by Holt: American Medicine, new series, vol. viii, No. 6, pp. 381 389.

Procedure.—An ordinary aspirating needle attached to a short rubber tube (2 to 3 inches) which fits closely to a glass Luer syringe is

Fig. 46.—Tube with window, cuff, and tape; bottle with long and short glass tubes, half filled with salt solution; the long tube is always below the level of the fluid (Kenyon).

introduced into the chest in the seventh or eighth space in the scapular line, and the presence or absence of pus ascertained. The introduction of the needle should take place just below the lower border of the rib, in order to avoid the artery. The larger portion of the pus should be aspirated with the syringe, as this considerably simplifies the procedure

thereafter. After completion of this step the rubber tube is clamped and the syringe removed.

A bistoury is inserted into the pleural cavity along the needle; this puncture wound is now enlarged between the needle and the rib below it. The incision should be the size of the drainage-tube, and not as large as the cuff; in this manner the drainage-tube with cuff attachment will be found to fit most snugly.

The apparatus consists of a bottle and rubber drainage-tube, the former of about one pint capacity, and filled three-quarters full of warm saline. The vessel is equipped with a perforated rubber cork into which fit two glass tubes, one just through the cork and the other reaching almost to the bottom, and connecting by its outer end with the drainage-tube. This tube is made of stiff rubber, inside diameter being $\frac{3}{16}$ to $\frac{1}{8}$ inch and the wall of about $\frac{1}{16}$ inch thickness. A soft-rubber tube collapses too readily and will not do. A window is cut near the end of the tube, and a narrow piece of tubing, fully $\frac{1}{4}$ inch long and from $\frac{4}{16}$ to $\frac{5}{16}$ inch inside diameter, is stripped over the drainage-tube, leaving about 1 to $1\frac{1}{2}$ inches protruding—just sufficient to enter the pleural cavity and effect drainage. Over the drainage-tube is threaded a piece of tape (button-holed) about $\frac{1}{2}$ inch wide and 5 to 6 inches long. This is made to fit snugly over the cuff, and in this manner helps to retain the tube within the pleural cavity.

Fig. 47.—Dressing complete (Kenyon).

The drainage-tube is inserted into the chest by means of an ordinary artery clamp. The tape is drawn tightly over the chest and made fast with adhesive strapping. The latter may be "built up" around the tube, thus adding further protection against leakage, and, in addition, serving to anchor the tube within the chest. Some split gauze around the tube fastened with adhesive completes the dressing. In order to promote siphonage the bottle is raised above the patient and some of the saline is permitted to run into the chest, in this manner increasing the fluidity of its contents. Usually the expansile power of the lung is

sufficient, with a little stripping of the tube, to effect immediate drainage. Occasionally it will be observed that very little or no pus drains during the first twenty-four hours or so, and that a great deal of air bubbles into the bottle, along with some blood-stained fluid. In these cases it may safely be assumed that the lung itself has been punctured and the tube, in these instances, should be shortened. The infant may be placed in bed, propped in such a manner as to effect the best drainage.

During the first day or two it is usually necessary to empty the bottle two or three times, and in order to do this the rubber tube is disconnected from the bottle and the end covered with gauze and clamped. If the discharge is very thick, the chest may be irrigated in the manner described above. With effectual drainage the temperature usually drops within twenty-four hours provided an extension of the pneumonic process is not present. A sudden rise is always suggestive of a plugging of the tube with fibrin clots, and should be investigated by removing the tube and inserting a fresh one. Sometimes a larger tube is necessary in order to effect better drainage.

The average time for leaving the tube in the chest is from two to three weeks, although in protracted cases drainage is sometimes necessary for two months. With a normal temperature, general improvement in the child's condition, cessation of discharge, and absence of leukocytosis the tube may usually be safely removed and the granulating edges tightly approximated with adhesive. Rarely is it necessary to reinsert the tube. In cases coming to autopsy either through extension of the pneumonic process or from general sepsis, the drainage has, without exception, been complete.

The advantages claimed for this method may be summarized as follows:

1. Simplicity and facility of the operation.
2. Freedom from shock.
3. Absence of pneumothorax.
4. Single dressings which do not require frequent changings, and thereby lessen the danger of a mixed infection.
5. Shortened convalescence.
6. Efficiency of the drainage.

Double Empyema.—But two cases coming under my observation have had both pleural sacs involved. In such cases both sides should not be opened at the same time, on account of the danger of collapse of the lungs. There are usually adhesions present sufficiently strong to prevent this, but we have no means of knowing this beforehand. In both of my cases the left pleural cavity was opened first, in order to relieve the pressure upon the heart and the great vessels.

Illustrative Cases.—In one case a considerable quantity of pus was removed from the right side by aspiration at the time of the operation on the left side. The right side was operated upon four days later, by which time sufficient adhesions had formed to prevent collapse of the lungs. The patient, a boy of two years, made an excellent recovery.

The second patient was one year of age. Pus had been present in both sides for a considerable time. The left side was opened first. The sac on the right side was

smaller than that on the left, and was operated on by incision three days later. The child was very much reduced by the protracted illness. In spite of the free daily irrigation of both cavities, the typical temperature persisted until death, probably on account of the very extensive suppurating surfaces. The child died from exhaustion twelve days after the second operation.

Empyema Necessitatis.—Spontaneous rupture of the pleural sac may occur in cases of empyema of considerable duration which are not properly diagnosed or not operated upon if diagnosed. Cases of this nature have been reported in which the pus ruptured into the esophagus, into the bronchi, or through the diaphragm into the peritoneal cavity.

Illustrative Cases.—In two of the cases seen by me spontaneous rupture occurred. In the first, pus ruptured into the bronchi. The patient was a well-nourished boy three years of age. The pus was sacculated over the anterior portion of the left lung. The parents, not particularly intelligent people, objected to the operation, and while it was under consideration by them, two or three days after the diagnosis was made, the pus ruptured into the bronchi and was discharged from the mouth in large quantities during a coughing paroxysm. The child made an uninterrupted recovery.

The other patient, a boy of two years, came under observation for a soft, fluctuating swelling, the size of a small orange, on the right side, immediately below the nipple. Exploration with a hypodermic needle showed pus. An incision was made and about three ounces of pus discharged. When the sac was emptied, it was found to communicate with the right pleural cavity by an opening between the seventh and eighth ribs. The wound was dressed and the child recovered without further complications.

PULMONARY GANGRENE

Pulmonary gangrene is a very rare complication of pneumonia. I have seen but three cases, all of which developed during the course of a bronchopneumonia. The gangrene is supposed to be due to an embolism of some branch of the pulmonary artery, or to a septic thrombosis. The odor of the breath is most characteristically offensive, and is in itself diagnostic. As a complication of pneumonia pulmonary gangrene is invariably fatal.

Except for the odor of the breath, there are no significant symptoms which may not exist with the usual attack of bronchopneumonia.

PULMONARY ABSCESS

Pulmonary abscess is a very unusual complication of pneumonia. At any rate, comparatively few cases are diagnosed, because of the occurrence of the abscess with empyema or because symptoms resembling empyema are present. The abscess is usually discovered during exploration for pus in the pleural cavity.

Illustrative Case.—The only case of this nature that has occurred under my personal observation was that of a patient two years of age. The case was one of the first in my private practice. The child had a pneumonia of the right upper lobe, which failed to resolve after abatement of the urgent symptoms. The temperature continued at 101° to 102° F., and there was a distressing cough. The family were becoming restless, and my patient was about to pass into other hands, when, at the family's suggestion, I changed the medication and gave a mixture containing full doses of syrup of ipecac and ammonium chlorid. This was given repeatedly without dilution, against instructions, and produced violent emesis. During a vomiting seizure the child brought up a considerable amount of pus, after which the recovery was prompt. Evidently the straining had produced a rupture of a pulmonary abscess into one of the larger bronchi.

PULMONARY TUBERCULOSIS

Infection of the lungs with the tubercle bacillus furnishes the chief manifestation of tuberculosis in the human. The lungs are the most active seat of the process in at least 90 per cent. of the cases.

Pathology.—In the most acute form of pulmonary tuberculosis the lungs contain gray, translucent tubercles in varying numbers. These may be only few in number, or both lungs may be very closely studded with them. The lesions may also be present on both surfaces of the pleura. Acute bronchopneumonia, with or without fibrinous pleurisy, may exist. In a late stage the tubercles undergo cheesy degeneration and are yellow in color. The coalescence of neighboring tubercles may give rise to cheesy masses, which eventually undergo softening. The tubercles are more often peribronchial than perivascular in distribution. Owing to the more direct course of the right main bronchus, the right lung is often involved before the left.

Cheesy degeneration of an area of pneumonic exudate may occur, and the resulting cheesy pneumonia frequently leads to softening and cavity-formation. These cavities may occur in any part of the lung, but are most common in the right middle and upper lobes, and usually communicate with a bronchus. Their walls are irregular and grayish in color; blood-vessels may be seen crossing them; and their contents are cheesy or necrotic material.

The connective tissue of the lung is increased in cases of pulmonary tuberculosis which have undergone repeated attacks of pneumonia, or which follow empyema of long standing. In such cases the pleura also is thickened and may be covered with a cheesy exudate.

Phthisis as it is seen in the lungs of adult subjects is not met with in children under eight or ten years of age.

The bronchial lymph-nodes in cases of pulmonary tuberculosis are involved in the tuberculous inflammation in about 97 per cent. of the cases. The lesion of the glands almost always, but not invariably, antedates that of the lung. The nodes are enlarged, and on section show all stages of tuberculosis, from discrete tubercles with small cheesy centers to cheesy degeneration of the entire node. Softening or suppuration is very common, while calcareous degeneration of a tuberculous focus in a lymph-node is infrequently seen in infants, but is less rare in children over two years of age. The bronchial and mediastinal lymph-nodes may be so much enlarged as to afford dulness on percussion and occasion respiratory difficulty from pressure.

Symptoms.—In infants and very young children there is no characteristic symptomatology. This seems strange in a disease of such gravity. Even in the miliary type, where we have been taught to expect high temperature, rapid respiration, and other severe toxic symptoms, such symptoms do not always exist. The signs correspond to those of bronchopneumonia—fever, 101° to 104° F., rapidity of respiration, cough, and the chest signs peculiar to catarrhal pneumonia. There may be only cough and the evidence of a generalized bronchitis. The

temperature range is not characteristic, and may not differ from that of bronchopneumonia.

A suspicious symptom in an infant is steady emaciation out of proportion to the other positive evidences of disease. The child takes the food well, sleeps well, and is comfortable. There may be a slight elevation of the temperature or no elevation throughout the illness—in fact, I have known the temperature to run a subnormal course.

In older children after the third year the disease manifests itself by more distinct signs, such as emaciation, loss of appetite, fatigue on slight exertion, and perhaps night-sweats. There is, moreover, a troublesome dry cough with little expectoration. Elevation of temperature in older children is an invariable symptom. It may not be high, however, perhaps not above 102° F. in the evening. The child complains of chilliness and soon shows signs of anemia. Pain is unusual, and hemoptysis rarely occurs.

In the miliary type in older children the symptoms are also active, particularly the temperature, which will range very high,—103° to 105° F.,—or it may be low in the morning and high at night. The respiration and the pulse are rapid. Cough is not a prominent symptom. There is rapid loss in weight.

It will be observed that the symptoms may aid us but little. The diagnosis is to be made with laboratory aid.

Diagnosis.—For the positive diagnosis of tuberculosis in children the presence of the tubercle bacilli must be proved. The examination of the lungs, except by showing the existence of a cavity, aids us but little, for, in the miliary type, there may be tuberculosis without chest signs. The various lung changes which may be evident on examination in no way differ from those which may be found in acute or chronic bronchopneumonia. Accompanying tuberculosis, moreover, there may be a bronchial catarrh, which in no way differs in its manifestations from that of simple generalized bronchitis.

A positive von Pirquet test (p. 679) is strong corroborative evidence of tuberculosis in young infants. I have seen the value of this sign proved in a large number of cases. In the case of older children the test, while positive, may be misleading, as the tuberculosis may be a latent process or entirely healed, and have no bearing on the immediate illness.

After the fourth or fifth year the diagnosis is seldom beset with the difficulties that surround the infant. At the later period of life localized signs of bronchitis, or partial or complete consolidation with dulness, may be manifest. Further, children at this age expectorate, so that collection of the sputum is easily accomplished.

Methods of Obtaining Sputum.—In dealing with infants who do not expectorate, a satisfactory method of obtaining the bronchial secretion is to pass a sterile catheter into the child's esophagus. This excites coughing and the secretion is brought up through the larynx and adheres to the tube.

Another method which may be used consists in irritating the pharynx

with a small piece of sterile gauze grasped in an artery clamp. As a result of the coughing thus induced the secretion from the trachea will be deposited on the gauze. Several tests may be necessary before the bacilli are discovered.

Bacilli in the Stool.—To search for bacilli in the stool is not a very satisfactory procedure, and is not necessary, in view of the success attending the above methods of securing material for examination. In suspicious cases in which the sputum examination fails to reveal the bacillus the stools should be examined.

Prognosis.—The prognosis for infants is very unfavorable. Nevertheless in infants, healed tubercular foci are occasionally found at autopsy. A child eighteen months of age who died of diphtheria had a large encysted calcareous tubercular nodule in the left lung, 1 inch by 1½ inches in size. Likewise the bronchial glands may show evidences of previous disease. In view of the large percentage (over 60 per cent.) of positive reactions to the von Pirquet skin test in children past ten years of age, it would seem that there are many more cured cases in children than has heretofore been appreciated. After the fifth year, if the case is seen reasonably early, if the child has a fair resistance, and if the management can be suitably carried out, the prognosis is very good indeed. I have had a recovery from pulmonary tuberculosis in a child of four years. The prognosis is further favorable if the infection is primary. If there is a lighting up of an old tubercular lesion in the bronchial glands or elsewhere, the prognosis is much less favorable. I have repeatedly had recoveries in New York city in primary cases in children who could not be sent away.

Associated Lesions.—The invasion of the tubercle bacillus usually means the involvement of more than one organ or portion of the body.

The Liver.—An autopsy in a case of pulmonary tuberculosis will very frequently show, in addition to the evidences of the disease in the lung and pleura, that the liver is involved to the extent of showing a generous distribution of tubercle bacilli in its surface and in the liver substance.

The Spleen.—It is rare, in making a postmortem examination in pulmonary tuberculosis, not to find the spleen the seat of the disease. Both the surface and the splenic tissue may be filled with tubercular deposits.

The Heart.—Tuberculosis of the heart muscles is very unusual. A few cases have been reported. The pericardium is occasionally the seat of a few tubercles. They are usually found when there is an extensive general tuberculosis. Their presence does not constitute tuberculosis of the pericardium.

Stomach.—Tuberculosis of the stomach is of very rare occurrence. Hale reports having seen but five cases in his large autopsy experience.

Intestines.—Infection of the intestinal mucosa without further abdominal involvement is occasionally seen at autopsy.

The Kidney.—The kidney is very frequently the seat of tuberculosis. About 25 per cent. of my cases have shown such lesions. They are

usually of the miliary type, scattered over the surface, with a few in the kidney substance.

Tuberculosis of the *larynx* in children is of very unusual occurrence. Demme reported a case in a child four and one-half years old (Koplik).

The pancreas, thymus gland, and *peritoneum* are rarely at autopsy found to be the seat of a few miliary tubercles.

Tuberculosis of the *cervical lymph-glands, brain, mesenteric glands, peritoneum,* and *abdomen* will be discussed in separate chapters.

Treatment.—*Climate.*—For those who are so situated financially as to have the advantages of an equable climate, a change of residence or sanitarium treatment should be provided. A dry climate of equable temperature that will allow the tuberculous child to spend the greatest number of hours in the open air is best. The climate of southern New Mexico and Arizona is exceptional for these cases. I have had children do well in the Adirondacks and in Sullivan County, New York, but the severity of the winter makes these localities less desirable.

Diet.—Equally important, if not more so than climate, is the nutrition of the patient. This must be raised to the highest possible standard, but there should be no overfeeding, such procedure being of no value in any disease in the young. My patients have improved most on a high-proteid diet of milk, meat, and eggs, and a high proteid cereal, such as oatmeal, and the legumes—dried peas, beans, and lentils, which are given in the form of a purée. I have found it advisable not to insist that a definite amount of food be given in twenty-four hours. The mother or nurse is to be told, however, that these foods, prepared in different ways so that the child will not tire of them, are to form a considerable part of the diet. Green vegetables, fruits, and plain desserts should be given for the sake of variety and to stimulate the appetite. When three meals a day are given, with, perhaps, a glass of milk in the middle of the afternoon, I have been able to maintain better nutrition than with more frequent feedings. Forced feeding in children often defeats its own purpose by producing disgust for or intolerance of food. The child should be fed on nutritious food, for which an appetite must be developed; for, inasmuch as recovery is dependent largely upon nutrition, the question of appetite and food capacity is of paramount importance. Candy, sweet crackers, and other harmful articles should not be allowed. In order to satisfy the candy craving, a small quantity of sweet chocolate may be given after the noonday meal. The best appetizers that we can furnish the child are reasonable exercise, entertainment and play that do not fatigue, and fresh air in abundance. Upon our ability to meet these requirements depends, to a large degree, the outcome of the case.

The majority of the children with pulmonary tuberculosis cannot be sent to sanitariums or to health resorts. The patients must be treated in their homes. This I have done successfully in New York city even among the tenement population. The basic principles of management comprise a properly directed life, good food, and fresh air. These are the weapons for fighting the enemy, regardless of whether

the residence is among the rich or poor, in town or in country. It is, however, among the tenement population that we experience the greatest difficulty. To tell these people how the child is to be fed is not enough. The feeding as directed entails considerable expense, which the parents may not be able to meet. If after personal investigation, which should be made in every case, it is demonstrated that proper nutrition or suitable clothing is impossible, I explain the situation to some charitably inclined person of means, and have yet to know of an instance in which clothing and a small but sufficient weekly food-allowance were not forthcoming. To the best of my knowledge the child himself has always had the benefit of the charity, and I have investigated such cases closely. An allowance of 25 cents a day for fresh meat and milk has often furnished what was required to bring the case to a favorable termination. The uselessness of much of our medical advice to the poor would, on slight reflection or a little investigation, be apparent. Directions are too often given for the care of the sick which are absolutely impossible of fulfilment. The physician should not trust to chance for results, but should act so as to make results.

Hygiene.—In addition to the diet above outlined, the advantages of an outdoor life, and the means by which fresh air may be obtained all the year round, should be fully explained. Any simple direction as to what may appear to be a radical procedure is rarely carried out without a rational explanation of its necessity. During the daytime the child should be kept outdoors. Close, tightly sealed sleeping apartments at night, however, will undo the good of the outdoor life during the day. The mother should be told to have the child sleep alone in the largest room of the apartment, and always in a room in which the windows are opened. This is usually possible. A sponge-bath or tub-bath should be given at bedtime, followed by brisk rubbing with a towel. If there is much emaciation, an olive-oil or goose-oil inunction should follow the salt bath.

Sometimes these directions are followed implicitly; at other times they are forgotten. It is astonishing, however, what rapid improvement will follow when a tuberculous child of the tenements is given the benefit of fresh air, day and night, with suitable food and cleanliness, even though the conditions are those of New York city. Among the more fortunate classes the same method of treatment, of course, with a more satisfactory application, is to be carried out. Among the well-to-do, however, we see fewer cases.

Tonics.—The usefulness of drugs depends to a large degree upon an increase of food capacity which their use may cause. Any of the prescriptions written below may be used alternately with cod-liver oil and malt, each being given for five days. For a child from seven to twelve years of age the following are useful restoratives and appetizers:

℞ Tincturæ nucis vomicæ . . . . . gtt. lxxij
Saccharini . . . . . gr. iss
Aquæ . . . . . q. s. ad ℥iv
M. Sig.—One teaspoonful every two hours. (Six doses daily.)

℞ Ferri et quininæ citratis . . . . . gr. xxiv
Vini xerici . . . . . ℥iv
M. Sig.—One teaspoonful in water three times a day after meals.

℞ Tincturæ nucis vomicæ . . . . . gtt. lxiv
Extracti ferri pomati . . . . . gr. vj
Quininæ bisulphatis . . . . . ℥j
M. ft. capsulæ no. xxx.
Sig.—One after each meal.

If night-sweats are present, from $\frac{1}{200}$ to $\frac{1}{160}$ grain of atropin at bedtime will often furnish relief.

Care of the Sputum.—Various devices for collecting the sputum may be obtained in the shops. A cheap and effective method is the use of a Japanese handkerchief, which, when used, is at once placed in a paper bag, the bag and its contents being burned at the close of the day. The dangers of infecting others should be fully explained to those in charge of the patient, kissing and fondling being forbidden.

IX. DISEASES OF THE HEART

DIAGNOSIS IN DISEASES OF THE HEART

Auscultation.—In the diagnosis of the different cardiac lesions in children auscultation is by far the most useful means at our command. For adults the physician employs auscultation, either with the naked ear or with the stethoscope, at the following chest areas:

The aortic area.
The pulmonary area.
The tricuspid area.
The mitral area.

In children tricuspid disease is of most infrequent occurrence. The pulmonary valves are involved only in congenital heart disease. In the routine examination for heart lesions in children the findings are simplified by the fact that aortic and mitral valve lesions are those encountered in an immense majority of the cases.

Owing to the difference in the position of the heart of the child as compared with that of the adult, the various sound areas also differ, and they vary at the different periods of childhood in accordance with the changing position of the heart.

Before the sixth year the mitral area corresponds with the apex-beat at a point in the nipple-line, or not more than ¼ inch without the nipple-line, in the fourth interspace.

The aortic area is slightly to the right of the sternum in older children; in the very young, over the sternum or at its immediate right border, at the level of the second or third interspace, varying with the age of the child.

The pulmonic area is on the same plane at the left border of the sternum.

At the end of the sternum, slightly to the left, is the tricuspid area.

It is by no means claimed that sound areas indicate the position of the valves, but we know, from combined clinical and autopsy findings in children, that murmurs indicating lesions of the respective valves are best heard at these areas.

The Normal Sounds.—The normal heart-sounds are not easily described. The normal cardiac cycle is made up of the *first* and *second heart-sounds*. Listening at the apex or slightly above, one hears at the time of the impulse the low-pitched, dull *first sound*, followed by the so-called *second sound*, which is short and higher pitched, and is supposed to be due to closure of the semilunar valves.

There is much divergence of opinion as to the cause of the first sound. Most diagnosticians believe that it is due to the contraction of the heart muscles, associated with the sudden closure of the mitral valves.

The heart-sounds vary considerably, depending upon the age of the patient; thus, in the infant both sounds are short and high pitched, and the muscle sounds which appear later in life, while present, are not prominent.

There is rarely difficulty in differentiating the two sounds in the young. The second sound is heard loudest over the base of the heart at points corresponding more or less closely to the pulmonic and aortic areas. In the event of difficulty in differentiation, the first sound should be sought at the apex. On gradually moving the stethoscope upward, the first sound will gradually become fainter and as the base of the heart is approached the second sound will be heard much more distinctly and loudest in the areas referred to.

The points of maximum intensity and areas of transmission of heart-sounds in children can not be arbitrarily laid down. In a general way the landmarks can be indicated, and in most instances will stand.

In diagnosing cardiac disease in children we have to consider the age of the patient with particular reference to the size and position of the heart, whether the chest wall is thin and muscular, or fat, and whether the child is crying or quiet. All cardiac sounds in the young are proportionately much louder than in adults. In delicate children the sounds vary greatly from those heard in the strong and robust. A first sound, characterized by a muffling or absence of clearness, is very frequently heard in delicate children. After an illness in a strong child this peculiar quality is very apparent, and is without doubt due to muscular insufficiency induced by degenerative changes which in most cases are temporary in character.

The changed first sound is often interpreted and treated as an evidence of endocarditis. In heart failure in serious diseases, the muscle element of the first sound gradually disappears so that this sound becomes short and snappy in quality, due to a degeneration of the heart muscle. The weak muscle sound tends to exaggerate the sound produced by the valve closure.

The second sound is caused by the closure of the semilunar valves, and as there are two sets of these valves, the aortic and pulmonary, the aortic second sound (in older children) is heard in the aortic area and the pulmonic second sound in the pulmonary area.

In babies and very young children a differentiation of the aortic and pulmonic second sounds is unquestionably difficult. (Imagination, however, carries many diagnosticians over obstacles.) The second sound is always accentuated in conditions in which the cardiac vigor is temporarily or permanently impaired, as in myocarditis with hypertrophy and dilatation of the left ventricle.

Inspection.—Inspection alone is of little value in cardiac examination. One learns nothing by inspection that may not be discovered through palpation, percussion, and auscultation. In acute cardiac disease in which there is often a decided overaction of the heart, a decided undulating movement of the entire left chest anteriorly will be observed. This usually occurs when there is much dilatation or hypertrophy of the left ventricle.

Inspection may reveal a retraction of the chest-wall at the apex between the fourth and fifth interspaces. This closing-in is due to adhesions (the result of a former pericarditis) between the heart, the pericardium, and the chest-wall.

Palpation.—Palpation is useful in determining the position of the apex-beat, in judging of the force of the cardiac impulse, and in the detection of a thrill. The pericardial friction-rub and the heart rhythm may likewise be determined in this way.

Percussion.—For this examination, I prefer the upright position. Percussion is chiefly of value in determining the size of the heart. Hypertrophy or dilatation of both the right and left heart may be fairly accurately determined. This method is also of value in determining the amount of fluid in the pericardial sac.

The normal right limit of absolute dulness for the heart may be taken as the left sternal border. The midsternal line supplies the boundary for relative dulness. The left limit of dulness corresponds to a perpendicular line drawn slightly without the apex-beat.

The area of dulness will vary considerably in health. The younger the child, the further to the left will be located the border of cardiac dulness. This limit is best determined by percussing from a point in the anterior axillary line toward the right, in the fourth interspace.

HEART MURMURS

There are two gross divisions of heart murmurs: *Organic or valvular, inorganic or functional (non-valvular).*

Organic murmurs are the result of a change in the heart structure due to a congenital malformation or to deformities resulting from diseased processes which produce a thickening, contraction, shortening, or narrowing of the valves involved.

An enlargement of the orifice (*e. g.*, the mitral or aortic orifice) may also cause a murmur due to the resulting incomplete closure of the valves.

Regurgitant Murmur.—When the valves fail to close, a murmur is caused by the regurgitation of the blood back through the opening. If the valves are roughened, the intensity of the murmur is the greater.

Stenotic Murmur.—When the blood is impeded in its passage through the heart as a result of a narrowing of the opening or roughening of the valves, a murmur of stenosis is the outcome.

Organic heart murmurs are classified as follows, depending upon the time of their occurrence in the cardiac cycle:

Systolic.
Diastolic.
Presystolic.

From the association of the murmur with one or another of the different phases of the cardiac cycle we determine the location and nature of the lesion at hand.

Location of Lesions.—In examination of the heart in order to locate a lesion by the murmur we must determine when it occurs in the cardiac cycle, its point of maximum intensity, and its area of diffusion.

Acquired Lesions.—In children acquired valvular lesions will almost invariably be found to involve the left heart, the mitral valves being by far the most liable to disease.

Mitral insufficiency takes first place in the order of frequency of valvular lesions. Mitral stenosis is evidently present in about 10 per cent. of the cases of insufficiency. Lesions of the aortic valves are fortunately much rarer. The ratio of mitral to aortic disease is about 15 to 1.

Table Demonstrating Location and Character of Lesions Based Upon the Adventitious Heart-sounds or Murmurs

Systolic	Diastolic	Presystolic
Mitral regurgitation.	Aortic regurgitation.	Mitral stenosis.
Tricuspid regurgitation.	Pulmonary regurgitation.	Pulmonary stenosis.
Pulmonary stenosis.		
Tricuspid stenosis.		

Pulmonary stenosis occurs only as the result of congenital lesions, and tricuspid lesions in children are only observed very late in severe cardiac disease, as a result or accompaniment of right heart failure. In the absence of these etiologic conditions a systolic murmur in a child must therefore be attributed to mitral regurgitation or aortic stenosis. Moreover, for the reasons explained, a diastolic murmur means aortic regurgitation, and a presystolic murmur, mitral stenosis.

Acquired lesions in children will, therefore, permit of the following grouping:

Systolic.	Diastolic.	Presystolic.
Mitral regurgitation.	Aortic regurgitation.	Mitral stenosis.
Aortic stenosis.		

Keeping the time of the murmur in mind, we thus have a means of readily locating the lesions.

Mitral regurgitation is due to shortening or adhesions of the mitral valves, sufficient to prevent proper closure of the leaflets. The valvular defects are the result of a previous acute or chronic endocarditis. The murmur of mitral regurgitation is heard loudest in the apex region, over the so-called mitral area. In children, because of their thin chest-walls, this murmur has a wide transmission. The particular line of transmission is upward and to the left toward the axilla, and to the back, the sound being loudest at the angle of the scapula and between the scapula and the vertebræ.

Mitral stenosis (producing a presystolic murmur) is due to a narrowing or partial permanent closure of the mitral orifice as the result of adhesions which bind the valves together, and produce, in some instances, the so-called funnel or button-hole opening. The murmur is heard loudest slightly above and to the right of the apex-beat. In point of time it precedes the systolic or first sound of the heart. Not infrequently the murmur merges into that produced by the mitral regurgitation, completely replacing the first sound of the heart. The area of diffusion is quite circumscribed.

Mitral lesions which have existed for some time always give rise to

compensatory hypertrophy, with corresponding displacement of the apex-beat to the left. This may readily be determined by palpation and percussion, showing the degree of cardiac enlargement.

The Thrill.—As a result of the contracted orifice or the roughened valve surfaces, vibrations are produced in the blood-stream, which, when transmitted to the chest surface, produce a corresponding peculiar effect upon the palpating finger or hand of the examiner. This sign is known as a thrill.

Aortic obstruction produces a systolic murmur which is heard loudest over the sternum and the second left costal interspace; not over the second right interspace or to the right of the sternum, as in the case of adults. The murmur, which is usually harsh and grating in character, is widely transmitted in a lateral direction and also into the carotids of the neck. Autopsy usually shows the existence of adhesions between the semilunar valves.

In comparatively few cases a thrill may be felt over the upper portion of the chest and the carotids. In a girl patient eight years of age there is a most exceptional thrill over the dilated arch of the aorta and the carotids.

In *aortic regurgitation* the murmur is diastolic in time, and is heard not to the right of the sternum, but sharply against the left border, or over the extreme left of the sternum, on a level with the fourth costal cartilage. This murmur is usually associated with the obstructive murmur, and is due to a failure of the deformed valves to close. The area of diffusion is wide. There is always displacement of the apex-beat to the left. It is the condition of aortic regurgitation, preëminently, that causes visible pulsation of the carotids. In the child already referred to, the throbbing was so pronounced that not only was the head and body shaken, but the mother, who slept with the patient, was kept awake by the vibration of the bed.

Functional Murmurs.—Functional murmurs are most frequently encountered between the third and twelfth years. These murmurs are rarely found in infants except in those with marked anemia, but are present in a large majority of such patients.

The functional murmur is systolic in time, and is heard loudest at or slightly above the apex, with a uniform, circumscribed area of diffusion which extends for only a few inches in any direction. In character the murmur is soft and blowing. It is not heard at the back. There is no associated hypertrophy or dilatation of the heart or evidence of any stasis or dropsy. There is no accentuation of the second sound. The functional murmur is not at all unusual in rapidly growing children of both sexes. The presence of a functional diastolic murmur in children is practically unknown.

Venous Murmurs.—In anemia the normal venous murmur heard over the great vessels above the clavicle and posterior to the sternocleidomastoid muscle is intensified and exceeds its normal physiologic limits. The murmur is constant, although it may be accentuated when the patient stands with head inclined to the opposite side. The venous

murmur is to be distinguished from the arterial murmur by the fact that the former is continuous and not synchronous with the heart-beat.

Etiology.—Anemia probably constitutes the most frequent cause, yet functional murmurs are heard in apparently normal children, existing for a period of years and then disappearing. A temporary murmur will often be heard in boys after violent exercises or games of competition in which a great deal of physical work is involved. In girls the murmur may also result from bicycle-riding or prolonged rope-jumping. In the spring of the year, after hard work at a school, many girls, under careful examination, will show a slight systolic murmur. In my opinion many of these cases are due to a dilatation of the left heart, producing a wider auriculoventricular orifice than the valves can completely close, with the result that there is a moderate amount of leakage. This, in time, is corrected as the heart muscle regains its normal condition.

Differential Diagnosis.—The chief point of aid in differentiating all murmurs, whether functional, acquired, or congenital, is the fact that in congenital and acquired heart disease there is a distinct lesion, and the murmur, as can be readily understood, is, therefore, constant. When, however, the murmur is due to causes related to muscular action or blood conditions, variations in posture or changes in the heart action, dependent upon work, will produce either a modification of the murmur or its complete disappearance. Even during a single examination a murmur of this nature may not always be the same.

Illustrative Case.—A boy patient, aged six years, has a soft, blowing systolic murmur, which presents varying degrees of intensity, depending upon whether he is lying down or sitting up or whether he is quiet or exercising. I have known this boy since birth. The murmur appeared when he was two years old. He is, and always has been, the picture of health. The murmur is gradually becoming less each year and when he is ten years old will probably cease to exist. An older sister gave evidence of exactly the same condition, the murmur in her case disappearing at about the ninth or tenth year. The murmurs in these children were not anemic or cardiorespiratory.

Cardiorespiratory Murmur.—This murmur deserves particular mention for the reason that it has a distinct entity. It may be heard in those cases in which the margin of the lung covers the heart. The murmur is usually systolic. It is heard best when the patient is standing and leaning forward, and at the end of inspiration is usually loudest. This murmur has no clinical significance, and is of interest only because it may be confused with other murmurs, functional or organic.

Murmur During Development.—As already noted, a functional murmur is not at all unusual in rapidly growing children.

After Acute Illness.—Inasmuch as the functional murmur which occasionally occurs with, and disappears after, an acute illness is in all respects similar to those that exist for several years and are later outgrown, it may be fair to assume that, in both instances, the same cause is operative, and that this factor, in all probability, is a moderate regurgitation, due perhaps to a dilatation of the mitral orifice preventing

proper closure of the valves, a condition temporary in both types of cases, but in the one of longer duration than in the other.

Treatment.—The functional murmur requires no treatment. But the condition causing the murmur may require attention, and upon this conclusion the treatment must rest.

PERICARDITIS

Pericarditis is an inflammation of the pericardium. No period of life appears to be exempt. My youngest patient was six months of age. The disease occurs most frequently between the third and the twelfth years. Cases have been reported by different authors as occurring in fetal life. Pericarditis is the result of an infection and occurs practically always as a secondary disease either in association with rheumatism or as a result of the invasion of pathogenic bacteria carried through the blood-stream or by the lymph from other portions of the body.

Bacteriology.—The bacterium most often found in the serofibrinous or purulent exudate is the pneumococcus, a fact which is explained by the frequency of pulmonary lesions as the primary source of the infection in these cases—70 per cent. to 90 per cent. The streptococcus or the staphylococcus aureus may be present; and very rarely B. influenzæ or the gonococcus has been found in the course of septicemia due to these bacteria. The tubercle bacillus, as the cause of fibrinous or purulent pericarditis in children, is almost unknown. Tuberculosis is more apt to involve the external surface of the sac, owing to possible extension of tuberculosis of the lung.

Poynton has found the diplococcus of rheumatism in the plastic exudate of pericarditis complicating rheumatism.

Pathology.—Pericarditis possesses as wide possibilities as pleuritis, and the pathologic processes are quite similar. Thus, there may be only simple dryness of the lining of the pericardial sac, or a complete filling of the sac with serous or purulent fluid. Over the heart and the enveloping membrane only thin layers of fibrin may form; or the heart and pericardium may become firmly bound together by layers and bands of fibrinous exudate. Autopsies on purulent cases often show the heart wrapped in the meshy fibrinous exudate to such a degree that the muscle surface cannot be seen, while the inner surface of the pericardium is lined with a granular exudate and the intervening space is filled with fluid serum or pus. On showing postgraduate students such specimens I have witnessed complete failure of the entire class to recognize the organ before them, so great has been the change from the normal appearance.

Symptoms.—Pericarditis is a disease which stands out peculiarly because of the wide range of the possible symptoms. Thus a case of purulent pericarditis may run its course under the observation of excellent clinicians and not be recognized until the autopsy, or the condition may produce symptoms of the greatest urgency and occasion intense distress to the patient. It is, therefore, impossible to lay down a symptomatology for the disease that will apply to all cases.

An important symptom indicating pericarditis is rapid respiration. Not only is the breathing rapid, as in pneumonia, but it is fairly characteristic in that the respirations are guarded. The patient wears an anxious expression and appears to have his mind centered on breathing. Carefully guarded inspiration is taken and careful expiration is carried out. At the same time the respiration is hurried and short, although not precipitate. This cautious breathing is due to the feeling of decided discomfort, constriction, and even pain which accompanies the chest expansion. The respiration is somewhat similar to that of acute pleurisy. The individual is not sure that he will be able to complete respiration, and perhaps feels obliged to cut it short.

The very rapid heart action is the most reliable symptom of the disease, often exceeding in apparent severity all the other symptoms. I have repeatedly seen patients from eight to ten years of age with a temperature ranging only about 100° F., with a pulse-rate from 130 to 150 or higher.

Cyanosis is present. The expression is anxious. In my urgent cases a prominent symptom has been extreme restlessness. Discomfort, pain, and a feeling of tension over the precordium are at times complained of. In other cases with apparently quite pronounced lesions there is little or no discomfort.

Diagnosis.—Pericarditis with rare exceptions is secondary to infection elsewhere. Thus in older children after the third year it is usually associated with endocarditis of rheumatic origin. I have seen a great many cases with this combination. In every case of endocarditis the physician should especially investigate the cause of exceptional rapidity of breathing and a rapid pulse. In younger children pericarditis is associated with pneumonia and empyema with greater frequency than with any other disease.

Physical Signs.—The first evidence of pericardial inflammation will be a rubbing, grating sound heard over the apex of the heart. The sound has a double quality and is heard both at systole and diastole, or perhaps only with systole. The sounds are known as the pericardial friction sounds. In well-marked cases they will be transmitted to the finger on palpation. Wherever heard they are distinctly localized. With the appearance of considerable fluid the friction sounds cease, but return when the fluid is absorbed. In cases in which the friction is questionable or indistinct, it will be accentuated by having the child lean forward in a sitting position.

Percussion.—When fluid in considerable amount is present, the area of cardiac dulness will be increased, the apex-beat will be difficult to determine, and the normal heart-sounds will become weakened.

In a fatal case in a six-year-old boy the apex-beat was not demonstrable, and the heart-sounds could scarcely be heard.

It has not been my observation that the apex-beat is displaced upward, as is claimed is the case in adults. With the presence of consider-

able fluid,—over two ounces in a child from three to five years of age,—the dulness will be increased to the left and upward.

With the larger effusion occurring in the boy above mentioned, the dulness extended to the right nipple and one inch outside of the left nipple.

The amount of fluid is difficult to determine in any case, and particularly so when endocarditis and myocarditis coexist, with accompanying hypertrophy and dilatation. The duration of the acute cases of rheumatic origin varies from a few to a considerable number of weeks.

Prognosis.—The prognosis in rheumatic cases is good if proper treatment can be followed. I have lost very few cases. We are dealing with a disease in which the management of the case determines to a large degree the outcome. Just how complete a recovery is made in the so-called recovery cases is difficult to determine, as there must be, in every case, adhesions between the heart and the pericardial sac. A condition known as adherent pericardium (p. 387) may be the outcome. The purulent cases, with so-called malignant endocarditis, have all been fatal, so far as my own observation is concerned.

Treatment.—In considering the treatment we may divide cases of the disease into two groups—those of rheumatic origin and those due to the invasion of well-known pathogenic organisms. In the rheumatic cases the sick-room management and the diet are the same as in the treatment of endocarditis (p. 381). In addition to the management pursued in endocarditis, additional symptomatic treatment is required.

For controlling excessive rapidity of the heart the tinctures of strophanthus and aconite may be of much service. To a child eight months to three years of age ½ drop of tincture aconite and one drop of tincture strophanthus may be given at two-hour intervals, but not to exceed six doses in the twenty-four hours. After the third year, one drop of the tincture of aconite and one drop of the tincture of strophanthus may be given at two-hour intervals—six doses in the twenty-four hours.

For the extreme restlessness which often exists codein or paregoric may be given. For a child under two years of age paregoric is safer. It may be given in doses of from 10 to 20 drops and repeated when indicated at intervals of two or three hours. Older children—between the second and sixth years—should be given codein in doses of from $\frac{1}{10}$ to $\frac{1}{6}$ grain. After the sixth year, ¼ grain may be given, to be repeated at three-hour intervals only, not more than three doses being given in twenty-four hours.

As soon as the diagnosis is made, if the case is of rheumatic origin, it is advisable to begin giving the salicylate of soda (wintergreen), with a view to prevention of an effusion into the pericardial sac. To those under three years, 14 to 20 grains of the salicylate of soda should be given daily with twice the amount of bicarbonate of soda. As the salicylate may cause some gastric disturbance, it should never be given when the stomach is empty, except in milk or with some other food; 4 grains is as much as should be given at one time. After the third year,

from 20 to 30 grains of the salicylate may be given. At the tenth year, 40 grains may be given daily in divided doses, always in solution, under the same precautions as to giving the drug after meals. It is impossible and entirely unnecessary in this country to give the large doses of the salicylate which are given abroad.

For delicate children and those by whom the salicylate is not well tolerated, aspirin may be substituted; or the salicylate may be given by the bowel, in doses of 15 grains at a time. The medicine should be diluted with at least 4 ounces of water and introduced through a rectal tube which has been inserted at least 9 inches. The apparatus shown in Fig. 20 is a convenient means of injecting the solution. It should not be given oftener than twice daily, and should be immediately preceded by irrigation of the large intestine.

In the comparatively infrequent cases in which pericarditis complicates one of the infectious diseases, the salicylate treatment is not to be advised unless there is some suspicion of rheumatism in the case. The other methods suggested are to be carried out with the hope that the disease may be controlled. In this type of case the ice-bag is particularly serviceable. In the event of effusion so excessive as to interfere with the heart action, producing orthopnea and cyanosis, with feeble, irregular pulse, operation on the pericardium, such as aspiration or incision and drainage, is to be considered, although in the few operative cases which I have seen I have not been impressed with the great usefulness of this treatment. On the other hand, I have seen cases, in which there was an excessive accumulation of fluid, recover under less radical measures.

The Purulent Type.—When it becomes evident that pus is present in the sac, incision and drainage may be attempted, as the case will surely be fatal if the usual methods are pursued.

MYOCARDITIS

Myocarditis of mild degree is a frequent accompaniment of inflammatory disease of the pericardium and endocardium. The most severe cases, however, may not be of this type.

Etiology.—Acute parenchymatous myocarditis may follow various processes, but is most often due to the activity of the toxin of the pneumococcus, the typhoid bacillus, or the diphtheria bacillus. Inflammation of the endocardium or the pericardium may extend to the myocardium.

Further references to the causation of this disease are included in the discussion of the pathology.

Pathology.—Classifications of myocarditis are more or less artificial. Acute and chronic forms and parenchymatous and interstitial types of inflammation are recognized.

Acute parenchymatous myocarditis usually results from an acute infection or toxemia, such as diphtheria, typhoid, or scarlet fever. The heart muscle is pale in color, soft, and somewhat friable. The heart itself may be dilated. Microscopically, the muscle-cells show granular,

hyaline, and fatty degenerative changes, and frequently contain vacuoles; the nuclei stain imperfectly. In the interstitial tissue, polynuclear and lymphocytic infiltration and even some extravasation of blood may occur, these conditions being most marked in the neighborhood of blood-vessels.

The reparative process is largely that of replacement fibrosis, a productive inflammation terminating in the substitution of fibrous connective tissue for the degenerated cells. Development of new muscle tissue also occurs. This, however, is probably brought about by simple hypertrophy of undegenerated muscle-fibers, rather than by true hyperplasia of these elements.

Acute suppurative myocarditis may result directly from an abscess in the mediastinum or a purulent pericarditis, but is more frequently due to a general pyemia caused by the pneumococcus, streptococcus, staphylococcus, or gonococcus. The wall of the heart contains miliary pus foci and small extravasations of blood. Microscopic examination shows the vessels to be filled with embolic products, and surrounded by the small hemorrhagic areas and collections of pus-cells already described. The process, although essentially one of interstitial inflammation, is regularly accompanied by considerable degeneration of the muscle-fibers. In the rare cases where recovery from suppurative myocarditis occurs, the defects in the heart are remedied by fibrous tissue.

Chronic interstitial myocarditis in childhood is a productive reparative process, usually secondary to inflammation of the acute type. The development of this condition to compensate for atrophy of the heart musculature caused by defective blood-supply through partially occluded coronary arteries is essentially a change of later life. When due to syphilis, chronic myocarditis in children is usually accompanied by endarteritis. Gummata are rare, although Treponema pallidum may be demonstrated in the myocardium.

Symptoms.—The most characteristic early sign of myocarditis in a child is a persistently irregular pulse, with or without a tendency to increased rapidity. It is not at all essential that the pulse be rapid—in fact, it is not at all unusual for it to be slower than normal. When such irregularity occurs after an acute disease, and particularly when there are occasional periods of cyanosis, myocarditis may be expected. It is often difficult to judge accurately of the heart's action when the child is awake, because of the excitement and possible resistance which the presence of the physician may occasion. For this reason, in suspected cases, the child should be examined, if possible, when asleep.

When the child develops the above symptoms, he should be watched with the greatest solicitude, as the more urgent symptoms of pallor, marked cyanosis, and syncope may occur at any moment. The pulse becomes very irregular and thready, or it may be lost entirely at the wrist, the patient presenting a picture of impending dissolution. In pneumonia, in septic cases of diphtheria, and in the exanthemata, the symptoms of acute myocarditis are those of early heart failure and are of grave significance. The pulse becomes rapid and irregular, cyanosis

is constant, and the respiration is increasingly difficult because of the sense of pressure and constriction in the cardiac region.

Diagnosis.—The diagnosis is based upon the irregularity of the pulse following an acute infectious disease, and upon the sudden attacks of cyanosis and collapse. Auscultation is of value only in demonstrating the weakness and indefiniteness of the first sound.

Treatment.—*Rest in Bed.*—When the condition of myocarditis follows even a mild attack of one of the infectious diseases, the invariable rule of absolute heart rest, which I consider the most important feature in the treatment, must be insisted upon. The patient, whether in hospital or in private practice, should not be allowed to sit up or even to raise his head from the pillow; a trained nurse should remain constantly in attendance, so that the child may be read to, or otherwise entertained while physical exertion is prevented. He may be permitted to use his arms, to play with simple light toys, but all other exertion must be prohibited. Aside from provisions for the recumbent position, quiet, a daily bowel evacuation, and easily digested food, given in small quantities, little treatment is required. It is important to keep the stomach free from distention with either gas or food. I prefer small quantities of nourishment administered at frequent intervals to large quantities of food given at the usual meal-time.

Drugs.—In the more severe cases with cyanosis and dyspnea a hypodermic loaded with strychnin, $\frac{1}{50}$ grain, and digitalis, $\frac{1}{100}$ grain, should be kept constantly at the bedside.

In one of my cases following scarlet fever so urgent were the symptoms that three physicians were engaged for several days, each being for eight hours daily at the bedside, in addition to the two trained nurses, each of whom was doing twelve hours' duty.

My patients have all been given strychnin, with the thought of possible associated involvement of the cardiac ganglion. Moreover, certain portions of the heart muscle obviously remain free from the degenerative process and may be favorably influenced by the strychnin. To a child one year of age $\frac{1}{200}$ grain may be given three times daily. From the first to the third year, $\frac{1}{200}$ to $\frac{1}{100}$ grain may be given four times daily. After the third year the dose is subject to considerable variation, the amount depending upon the urgency of the case. Ordinarily, from $\frac{1}{100}$ to $\frac{1}{75}$ grain may be given four times a day. If the case is very urgent and the strychnin appears to improve the heart action, it may be given to the point of producing its physiologic effects, such as fibrillary twitching of the muscles of the face and the backs of the hands. Nitroglycerin should not be used. Digitalis should be given but rarely to young children, as it is very apt to disturb the digestion if long continued; temporarily, in treating older children, it may be used with advantage. A child from five to ten years of age may be given daily (and preferably after meals) from three to four drops of the tincture well diluted with water. The tincture of strophanthus may be of more service than any other drug. It will be found particularly useful in those cases in which there is a tendency to rapidity of the heart

action. A child one year of age may be given one drop every two hours in the twenty-four; from the first to the third year, from one to two drops at two-hour intervals; and from the third to the tenth year, from two to four drops at intervals of from two to three hours.

Convalescence.—The tendency of myocarditis in children is toward recovery. How long each patient will require strict observation, and how long the treatment will ultimately need to be continued, must be determined by each individual case. One fact to be remembered, according to my cases, is that the child either dies suddenly or makes a complete recovery, so that in treatment it is well to err on the side of caution. I have found it safe, in a very few instances, to allow the child to sit up after six weeks.

In the very severe case above referred to it was not safe for the patient to sit up in bed until the end of the third month, and he was not allowed to walk until the end of the fourth month. After being kept under observation for one year he was discharged, and has remained well during the ten years which have since elapsed. At the present time there is no evidence whatever of his former illness.

A safe rule to follow is to keep the patient in bed as long as the rapidity or irregularity of the heart exists. When the heart action in the recumbent position is apparently normal, the patient may be allowed to have his head raised by an additional pillow. In this way the head and shoulders may be gradually raised higher day by day, so long as the effect upon the heart muscle is not unfavorable. In the same way, standing and walking may be gradually begun. Following out this careful method of heart rest, and being governed solely by the heart action, which indicates the heart power, I have seen apparently hopeless cases completely recover. Whether fibrous changes are present which may have a later influence there is, of course, no means of knowing.

CONGENITAL HEART DISEASE

In congenital heart disease there is a structural fault. The heart in one or more respects is anatomically imperfect.

Symptomatology.—Congenital heart disease is sometimes suggested by the appearance of the patient. There may be cyanosis, which is observed only when the child cries or strains, or the patient may be a "blue baby," in which case the cyanosis is permanent and of such a degree as to make the diagnosis positive without further aid than inspection.

By far the greater number of my cases have been discovered in the routine examination and had presented no external sign whatsoever that a lesion existed.

Prognosis.—The future of the child with the congenitally defective heart is very uncertain. I have seen a very few of these patients go on to the adult period of life and suffer no inconvenience. In by far the larger number, however, the approach of the runabout and active period (if the child survives to this time), with the extra demand upon the organ that this age necessitates, results in failure of compensation and dilatation, followed by the usual train of symptoms peculiar to right heart failure.

A girl with congenital heart disease developed several attacks of angina and cyanosis at the thirtieth month. This continued at rather infrequent intervals for a year, when she died in an attack.

Pathology.—The initial and chief lesion in the majority of cases is at the pulmonary orifice, and is supposedly due to a fetal endocarditis which causes a stenosis at this orifice, which in time, through interference with the blood-current, prevents a closure of the auricular or ventricular septum.

Cases are occasionally seen, however, in which the defect in one or other of the septa exists without atresia or stenosis at the pulmonary orifice.

Patent ductus arteriosus is rare. Its presence is usually associated with other defects, such as pulmonary obstruction and septum defects.

Fig. 48.—Clubbed fingers in congenital heart disease.

Changes in the great vessels are occasionally encountered. Thus, the aorta may have its origin from the right ventricle, and the pulmonary artery from the left ventricle.

Cardiac Enlargement.—Enlargement of the heart is the rule in congenital cases. Usually the right heart will be found particularly involved.

The above conditions represent some of the more common abnormalities. One who has observed many autopsies upon children has had abundant opportunity to verify the above statements and to see other abnormalities which are of academic interest only.

Classification of Lesions.—It is a hopeless task to attempt to classify a congenital lesion according to the nature, maximum intensity, or transmission of the murmur. I have seen this attempted time and again, the autopsy showing results that were not flattering to the diagnostic acumen of the examiner.

Diagnosis in Infants and Very Young Children.—The most suggestive feature relating to diagnosis is a pronounced cardiac murmur in a child under eighteen months of age. Children before this period of life rarely have rheumatism, which is the cause of endocardial lesions in over 95 per cent. of the cases. The absence of cyanosis is no evidence against the diagnosis of a congenital lesion, as a great majority of my cases have not shown this symptom. On the other hand, there may be a marked degree of cyanosis and not the slightest trace of a murmur. At autopsy such a case showed an entire absence of the ventricular septum.

First, then, the age of the child is strongly suggestive as to whether the condition is due to a congenital abnormality or an acquired disease. If the patient is under eighteen months of age or even under two years, the lesion is in all probability congenital.

Second in importance I would place the character of the murmur, which is usually systolic and of a very loud, rasping character, heard loudest in the third or fourth left intercostal space with a very wide area of diffusion. Many of these murmurs may be heard over the entire thorax, both anteriorly and posteriorly.

Differential Diagnosis in Infants.—At this period of life the murmur of congenital heart disease has to be differentiated from the murmur found in anemia. Not all congenital murmurs are as characteristic as above described. They may lack the element of loudness and harshness and be soft and blowing in character. This, however, is of very infrequent occurrence. In such an event a differential diagnosis between a congenital cardiac lesion and a murmur due to anemia is most difficult, for the anemic murmur is systolic in time, is heard loudest over the base, and has a fairly evenly distributed area of diffusion in all directions.

In such cases the blood examination is of decided service. In congenital heart disease there is almost constantly a very extreme polycythemia with high hemoglobin percentage and specific gravity, and a moderate increase in the white cells (Wood).

Murmurs Constant.—This fact is a valuable aid in differentiation. Murmurs due to a lesion are constant and vary little under different states. Whether the patient is at exercise, at rest, sitting, standing, or lying down, the murmurs are invariably present and vary only in intensity.

The Functional Murmur.—The chief characteristic of the functional murmur is the inconstancy of the sound, now loud, now weak. Not infrequently these murmurs disappear under stress and reappear when the stress is removed. They may disappear or become very faint with the patient recumbent, and reappear upon the return to the erect position. A relaxed heart muscle might be a cause of some of these cases.

The anemic murmur changes upon change in position of the patient, and during exercise it is inconstant.

Diagnosis and Differential Diagnosis in Older Children.—In children after the second year the differential diagnosis may also be difficult. It is to be remembered that in cases in which a congenital murmur is

well marked at this period of life there will usually be other signs that may aid us in our judgment. Cyanosis is present in a larger proportion of the older patients than of the very young. This is to be explained by the fact that the child, when very young, calls upon the heart to a comparatively small extent. With the assumption of active play and with running, stair-climbing, and stress of any nature, the defective heart fails to meet the extra demands, and cyanosis, clubbed fingers (Fig. 48), and shortness of breath develop. At this age, also, the question of anemia and developmental conditions arises. I have repeatedly seen patients who showed no inconvenience whatever until this more active period of life was reached.

Murmur After Illness.—The murmur of congenital disease is also to be differentiated from other functional murmurs than those of anemia (p. 398), which are practically all systolic in time and have a wide area of diffusion. These functional murmurs often occur during, or particularly after, severe illnesses, such as pneumonia or typhoid fever, when the heart has been severely taxed. With such a murmur there is no accentuation of the second sound, and no accompanying dropsy or cardiac enlargement.

ACUTE ENDOCARDITIS

Acute endocarditis is an inflammation of the endocardium, or lining membrane of the heart. Probably in all cases showing even a moderate degree of severity there is involvement of the adjacent heart muscle, so that when there is an endocarditis, there is a myocarditis as well, although the latter may be of little moment. Pericarditis has been a complication in about 5 per cent. of my cases. In the great majority of instances endocarditis is to be looked upon as a manifestation of rheumatism and not a complication.

Etiology.—Endocarditis is present in a considerable proportion of cases of chorea, the statistics of various authors varying from 6 to 55 per cent. Both the chorea and the endocarditis are active manifestations of acute rheumatism. In my own experience endocarditis has been present in not over 20 per cent. of the cases of chorea. Endocarditis occurs as a complication of scarlet fever, diphtheria, measles, and tonsillitis. In fact, there are few diseases of bacterial origin with which it has not at some time been associated. In two of my cases it was a complication of la grippe.

Age of Patients.—It is unusual to find endocarditis in children under three years of age. Few cases are seen between the third and fifth year. The period of greatest susceptibility is between the fifth and the twelfth years.

Bacteriology.—The vegetative forms of endocarditis are more frequently due to rheumatism than to any other infectious disease. Poynton and Payne have demonstrated the streptococcus of rheumatism in the vegetations of the heart valves. The bacteria are readily found only in the early stage of the endocarditis, and tend to disappear in the later course of the disease.

Acute ulceration or septic endocarditis is more often a secondary than a primary condition, and is caused by the localization on the heart valves of bacteria from the blood-stream. The bacteria causing the primary infection are present in the valvular ulcers. Streptococci, staphylococci, pneumococci, gonococci, typhoid bacilli, colon bacilli, influenza bacilli, and diphtheria bacilli have been found.

In chronic endocarditis no bacteria are demonstrable in the endocardial lesions.

Pathology.—Inflammation of the membrane lining the heart affects chiefly the valves; and most frequently, those guarding the mitral and aortic orifices. The latter fact has been explained by a theory that bacterial development is better favored by the fresh arterial blood of the left ventricle than by the venous blood (of low oxygen-content) present in the right heart.

The margins of the affected cusps are thickened and covered with small masses of necrotic tissue, fibrin, red corpuscles, leukocytes, proliferating endothelial cells, and bacteria. The chordæ tendineæ are frequently involved and undergo shortening, thickening, and a certain amount of fusion. In mild cases the integrity of the segments may not be lost, but more frequently, when the acute inflammation subsides, the valves undergo considerable cicatrization and contraction, and exist thenceforth as deformed and more or less inefficient structures.

In the severe forms of the disease, commonly termed malignant endocarditis, destructive effects are much more marked, and ulceration of the mural endocardium may occur. In such cases emboli frequently become detached from the friable vegetations on the valves, and may produce infarcts and abscesses in such remote organs as the brain, spleen, and kidney.

The usual sources of infection are wounds of the skin and mucous membrane, and inflammation of the alimentary, pulmonary, and genito-urinary tracts. Prominent in this category undoubtedly are diseased tonsils. Attacks of "simple" acute endocarditis may easily render the heart more susceptible to an infection of the malignant type.

Symptomatology.—By far the majority of cases of endocarditis present no symptoms whatever. Hundreds of these cases are overlooked because of this peculiarity of the disease, and because writers of medical books, in describing the disease, lay great stress upon a symptomatology of prostration, high temperature, and severity in general, that may occur in one out of ten cases, the result being that nine are overlooked. A large majority of the cases of endocarditis coming under my observation (mild acute endocarditis, not chronic valvular disease) have been discovered in the routine examination of the patient, and not because anything in the case had suggested the heart as a factor in the illness. Every physician who does considerable clinical work sees patients with valvular defects of long standing, who have no knowledge whatever that a heart lesion has existed. Those who examine for life insurance will particularly appreciate the force of the above statement. Children with rheumatic tendencies, as has been mentioned, are very susceptible to

endocarditis. I have repeatedly seen cases develop after or with a tonsillitis in a child with a rheumatic tendency or inheritance, the endocarditis being the active manifestation of the rheumatism.

Illustrative Case.—A boy six years of age was brought to the out-patient department at the Babies' Hospital because of a slight pain in his knee, which caused a limp. He had just recovered from a mild tonsillitis. In the routine examination an acute endocarditis was found, involving both mitral and the aortic valves. The boy made a complete recovery.

There are doubtless many cases of endocarditis which pass unrecognized and recover.

When symptoms are present, we find fever which presents wide variations,—100° to 105° F.,—depending upon the severity of the infection. The height of the temperature is usually a reliable indication of the gravity of the illness. With the high temperature there will be increased heart action—110 to 140. If the action is irregular, myocarditis also may be suspected. Pain over the precordium and shortness of breath are usually present.

Diagnosis.—The symptoms alone may be sufficiently pronounced to suggest the existence of endocarditis. It is by the physical signs, however, that suspicion is verified and the diagnosis made possible.

Inspection.—Inspection, if it reveals anything abnormal, will show an excessive action of the heart, producing an undulating motion of the cardiac area, with visible apex-beat.

Palpation.—Palpation confirms the existence of this overaction of the heart.

Percussion.—Percussion may reveal cardiac enlargement. The left ventricle becomes dilated early in the severe cases.

Auscultation.—Auscultation will reveal either a murmur (p. 365) or a combination of murmurs. In character the murmur may be soft and blowing, or harsh, rough, and grating. It may be systolic, diastolic, or presystolic; or it may be double, presystolic and systolic, or diastolic and systolic. The fact that the left side of the heart is always involved simplifies materially the localization of the lesion.

If due to mitral regurgitation, the murmur is usually soft and blowing in character, heard loudest at the apex, transmitted upward to the axilla, and plainly heard between the scapula and the spine.

In mitral stenosis the murmur is presystolic in time, and is heard loudest just above the site of the apex-beat. This murmur is not transmitted elsewhere, and is accompanied by a thrill (p. 367).

When there is combined mitral stenosis and regurgitation, the systolic murmur follows immediately upon the presystolic, making a prolonged murmur which completely obliterates the first heart-sound.

Aortic stenosis produces a systolic murmur, heard loudest at the second interspace, over the middle of the sternum, or at its immediate right border, and transmitted upward to the carotids.

In aortic regurgitation the murmur is diastolic in time and is heard loudest over the second and third interspaces.

Differential Diagnosis.—Endocarditis may be confused with temporary functional disturbances of the heart, giving rise to functional murmurs (p. 367). This statement, of course, applies only to mitral disease. After many disorders in children in which the heart has been severely taxed, a soft, blowing, systolic murmur develops. This murmur, however, is inconstant, changes more or less, or disappears upon change in the position of the patient, and, most important of all, has no line of transmission and is not heard at the back. After a few days or weeks, providing proper management is carried out, such murmurs disappear.

Prognosis.—The outlook, in a great majority of cases of endocarditis, is favorable for a complete recovery. In other cases, even under the best of management, the patient, after recovering from the acute disease, is left with crippled valves. When there is a very severe infection of the so-called *malignant type*, the outlook is most unfavorable. Recently a boy seven years of age died within forty-eight hours from the onset of the heart involvement. I have seen a considerable number of similar fatal cases in consultation work. The inflammation in such cases usually develops rapidly into a pancarditis, the heart muscle, the pericardium, and the endocardium all becoming rapidly involved, with resulting dilatation of the heart, which is often extreme.

Treatment.—*Rest in Bed.*—Whatever the nature of the infection, and whether the disease is mild or severe, one rule—that regarding quiet and rest—must be consistently followed. The child must remain in a recumbent position in bed, the bed-pan being used to receive the discharges. The use of the arms and the hands should be discouraged, particularly early in the attack, as it is at this time that the greatest damage is done to the heart. Reaching from the bed to the floor or to the table or chairs should be forbidden. The heart must be given as little work to do as possible.

Prolonged Inactivity.—In both pericarditis and endocarditis absence of stress of any nature should be secured until every evidence of the disease has disappeared, or at least until the heart becomes regular, and its rate, under a test of moderate exercise, approximates the normal. The longest period I have kept a patient recumbent was six months. This patient is now a young man, and all that remains of his very extensive endocarditis and pericarditis, comprising three distinct attacks, is a slight mitral regurgitant murmur with full compensation. Every patient is kept off the feet for at least six weeks, and several have not been allowed to take a step within three to six months.

Diet.—The diet should consist largely of fluids, administered in comparatively small amounts, at shorter intervals than in health. The bowels should move once daily. If a laxative is necessary, a saline should be given. A Seidlitz powder or magnesium citrate is usually effective. Distention of the stomach, whether by gas or by food, causes pressure on the heart and increases its labor. It is my custom, in these cases, to give five feedings in twenty-four hours, and not more than eight ounces at a feeding. Four ounces of milk and four ounces of gruel, with zwieback or toast, constitute the usual feeding. In

order to vary the diet, a weaker gruel, No. 1, flavored with an ounce or two of chicken or mutton broth, may be given; or a gruel of the same strength may be given plain, with sufficient salt to make it palatable. If the milk is well borne, it may be increased until one quart is taken daily. The enforcement of a strict milk diet is a mistake. The child very soon tires of it, digestion is impaired, and nutrition is correspondingly faulty. As the case improves, eggs, bread and butter, stewed fruit, poultry, fish, and plain puddings may be added to the diet. In order to facilitate freer feeding the number of meals should be reduced.

The Ice-bag.—A screw-top ice-bag half filled with chopped ice should be placed over the heart, and, if possible, kept on continuously. Children frequently become restless and irritable under too constant application of the ice, and in such instances it may be left off occasionally for half an hour or an hour.

Drugs.—In endocarditis following diphtheria or the exanthemata drugs are of little benefit; even the salicylate seems to have no beneficial effect upon these patients. For excessive rapidity of the heart action the tincture of strophanthus is more effective than any other drug. To children from five to ten years of age two drops may be given at intervals of from three to six hours. If there are much excitability and restlessness, $\frac{1}{6}$ grain of codein or 8 grains of sodium bromid may be given at sufficiently frequent intervals to control the condition. While every case of non-rheumatic endocarditis presents possibilities of serious and permanent damage to the heart, not every case, by any means, is of sufficient severity to demand other treatment than the ice-bag, rest, and an easily digested diet. It is often the milder cases that occasion the gravest sequelæ, on account of the lack of objective symptoms, and the liberties given the child by parents, who are with difficulty convinced of the gravity of the disease.

Antirheumatic Treatment.—Every case of endocarditis under my care which is not directly associated with one of the infectious diseases is considered and treated as though it were a case of *rheumatism*, owing to the exceeding frequency of this form of infection. Sodium salicylate, and sodium bicarbonate are early brought into use. To a child between five and ten years of age, from 3 to 5 grains of sodium salicylate obtained from wintergreen, with an equal quantity of sodium bicarbonate, are given after each feeding, five times daily. The medicine may be given in capsules or in solution. If the sodium salicylate is not well borne by the stomach, the equivalent dosage of aspirin or oil of wintergreen may be given. The salicylate should be continued with occasional intermissions of a day or two until such urgent symptoms as fever, rapid heart-rate, and dyspnea have subsided. The dosage should then be varied, 10 grains being given daily for five days out of fifteen. A child who has recovered from rheumatic endocarditis should be kept under close observation, and the parents should be warned as to the possibilities of a second attack.

Illustrative Cases.—In a private case, in spite of antirheumatic treatment, during the intervals four distinct attacks have occurred during the past five years.

A dispensary patient at the New York Polyclinic had his first attack when four years of age. So prominent was his rheumatic tendency that during the next four years, in spite of active antirheumatic treatment and a careful diet in the intervals, he had eight distinct attacks of endocarditis and died from the heart involvement in his eighth year. There were other manifestations of rheumatism in his case, and his family on both sides for several generations had been markedly rheumatic.

Recurrence.—Inasmuch as a recurrence is very probable, the patient, even while in apparent health, should have the benefit of a restricted diet, being allowed red meat but twice a week and a minimum amount of cane-sugar. During five days out of each month he should receive 10 grains of sodium salicylate (wintergreen) and 10 grains of sodium bicarbonate daily. This scheme of medication should be continued for at least two years, and much longer if the patient shows any further rheumatic manifestation, such as pains in the legs or repeated attacks of tonsillitis. The length of time during which absolute rest in bed is to be enjoined depends on the severity of the case. This time, in my primary cases, is from six weeks to three months. In the case of a boy who had had a very severe second attack, walking was not allowed for six months, the patient using a wheel-chair instead.

The rapidity of the heart's action is the best guide in deciding when the patient shall be allowed to walk. In a case of moderate severity the heart's action, which has been rapid,—140 to 160,—gradually becomes less frequent. The temperature may have continued for only a week or ten days.

Every child who has had acute endocarditis should have the tonsils enucleated.

Convalescence.—When the pulse-beat is reduced to 100, which is not to be expected earlier than the fourth week, the patient may be allowed to sit in a reclining chair. Previous to this, while still in bed, he may be gradually accustomed to elevation of the head by the addition of an extra pillow for an hour or more daily. Greater freedom is permitted when it is found that the patient can be indulged and the heart-rate still be kept below 100.

The above scheme of management may seem unnecessarily severe, but we must remember the importance of the heart in the economy, and see to it that if the patient cannot have a perfectly sound heart, it shall be damaged as little as possible. The treatment thus comprises the observance of every precaution that will tend toward the best possible outcome, no matter how drastic may be the requirements.

CHRONIC VALVULAR DISEASE OF THE HEART

Chronic valvular disease of the heart (acquired) is the end-result of an endocarditis which has resulted in certain changes in the valves and cardiac orifices, producing a permanent lesion. The acquired lesion in children will practically always be found on the left side of the heart, involving the mitral and aortic valves. With such lesions, compensatory hypertrophy, a conservative process, is usually associated.

Etiology.—A most important feature to keep in mind in connection with valvular disease of the heart in children is the source of the disease.

A large proportion of the cases (95 per cent. in my own experience) are due to rheumatic endocarditis. In the absence, then, of a history of endocarditis in association with pneumonia, diphtheria, or scarlet fever, which in my experience has been of rare occurrence, it may be assumed that the valvular lesion is of rheumatic origin, even though there may not be elsewhere, at the time, positive evidence of rheumatism. Not a few children showing cardiac disease without a history of actual acute rheumatism have a history of tonsillitis, angina, coryza, asthmatic bronchitis, or chorea, all showing recurrent tendencies. Such patients will often be found to have a rheumatic or gouty ancestry, and not infrequently they themselves are hearty eaters of red meat and sugars.

The great majority of cases of valvular defects recognized in early adult life are the result of unrecognized endocarditis of childhood.

Symptomatology.—Chronic valvular disease in children may exist unchanged for years if the lesion is not severe and if compensation is maintained.

The first symptoms of failure of compensation are *shortness of breath* and *rapidity of heart action*, both of which the child will mention in describing the condition. If the heart is not relieved, the patient will soon present evidence of right heart involvement, such as persistent general bronchitis, inability to assume the recumbent position, dropsy, and enlargement of the liver and spleen. Later the breathing becomes more difficult, the expression anxious, and the face drawn and cyanosed upon the slightest exertion. The superficial veins become dilated, and the pulse finally becomes very irregular and soft. Death in children with this disease is usually due to terminal bronchopneumonia.

Diagnosis.—Valvular lesions are indicated by adventitious heart-sounds, known as murmurs (p. 365), which are heard either with, or in place of, the normal sounds (p. 363).

The character, time, point of maximum intensity, and area of transmission indicate the location, and to a fairly accurate degree the nature, of the lesion.

Prognosis.—The prognosis depends to a large degree upon both the location and the nature of the lesion. In mitral regurgitation with good compensation the possibilities for long life are favorable, depending somewhat, of course, upon the age and condition of the patient. If the case is of long standing, the possibility of a complete cure is not to be considered. An unknown factor in these cases which has important bearing upon the future is the possibility of reinfection. When rheumatic endocarditis has once existed in a child it is liable to return; and in the event of recovery from a second or third attack, the heart is left in a more serious condition than ever before.

Mitral regurgitation with good compensation may not seriously inconvenience the individual for years if careful habits of life are followed. Neither need a mild degree of uncomplicated aortic stenosis cause great anxiety. Nevertheless, I always look upon stenosis at either the mitral or aortic orifice with apprehension, and my own results with the stenosis cases during years of observation have been far from satisfactory.

Aortic regurgitation is often associated with aortic stenosis, and the outlook for such patients as well as those with mitral stenosis is not favorable as regards the duties of active adult life.

If there is one word more than another that typifies the life of a child, it is the word "stress." Activity and excitement are so inherently a part of child life that the heart crippled by aortic disease is often called upon to do work which is impossible. Even if the patient attains the fifteenth year without loss of compensation, the heart is in a condition that entails semi-invalidism.

Treatment.—Realizing that rheumatic endocarditis is very likely to return, we should make it our first duty, after acquainting ourselves with the probable origin of a given case of valvular disease, to explain to the parents that other attacks are liable to occur unless means are used for their prevention. Enucleation of the tonsils should be practised here as after acute endocarditis.

In the absence of a history of endocarditis in association with pneumonia, diphtheria, scarlet fever, or other infections, it may be assumed that the lesion is of rheumatic origin, even though a history or actual evidences of rheumatism may be lacking.

Our first step in the management must be to regulate the life so as to prevent a recurrence of the heart involvement. With this end in view, it should be directed that red meat be given the child but once every second day, and that cane-sugar be given in great moderation.

A diet of plain, nutritious food, with nothing between meals, is a very important feature in the treatment of heart disease in children. Poultry, fish, eggs, milk, and high-proteid cereals may be given in increased amount in order to maintain nutrition. A tub-bath followed by a dry rub should be given daily. The bowels must not be allowed to become constipated, and moderate exercise should be encouraged.

Drugs Advised.—For five successive days out of each month a patient from five to ten years old should be given, after meals, 5 grains of salicylate of soda (wintergreen) and 10 grains of bicarbonate of soda. This, with the low meat and low sugar diet, is usually, but not invariably, sufficient to prevent a recurrence. Occasionally I have been obliged to give the above treatment for five days with intervals of only ten days. An interesting result of this treatment has been an entire disappearance of the growing pains, recurrent bronchitis, or low grade eczema, with which the child may have been afflicted.

Drugs Used With Caution.—The further management of valvular disease depends to a certain degree upon the location and nature of the lesion. Because a child has a cardiac lesion he does not necessarily require digitalis. Not a little harm is done, in the treatment of diseases in children, by giving powerful drugs when they are not indicated. Too often in heart disease the physician feels his duty done when he gives digitalis. Many times I have seen children taking digitalis and strychnin because of some cardiac lesion, while, at the same time, they were suffering from constipation, recurrent respiratory disorders, and per-

sistent indigestion due to dietetic errors, all of which had escaped the attention of the physician.

Mitral Regurgitation.—In mitral regurgitation, well compensated, the activities need be but little curtailed; in fact, the patient may be encouraged to indulge in outdoor exercise, although competition in all games requiring unusual exertion, tests of speed or endurance of any nature, such as running and racing, should be forbidden. When the patient is old enough, swimming, bicycling, horseback-riding, and golf may be advised. Boys, on arriving at the tobacco and alcohol age, must be told the dangers attending the use of either drug, and both must be forbidden. Girls with mitral insufficiency must be warned against excessive dancing, rope-jumping, tight lacing, and indiscriminate eating. For patients of both sexes, rational exercise is beneficial.

Mitral Stenosis and Aortic Disease.—When the aortic valves are involved either in insufficiency or stenosis, or when there is a considerable degree of mitral stenosis, the child's activities should be considerably limited. Under these conditions, with a view to the future, regardless of satisfactory existing compensation, I forbid the bicycle, swimming, dancing, baseball, or any sport or game which may call for much physical effort. Plenty of entertainment may be provided which does not call for great physical effort. The nature of the disease should be fully explained not only to the parents, but also to the patient, when the latter is old enough to understand, so as to secure hearty coöperation in governing the child's activities. Moreover, parents should be told particularly that tonsillitis or angina is a danger-signal, and that, on the occurrence of either condition, the salicylates are to be brought into use at once, even before the physician is summoned.

Ordinarily, it is not well to talk over a child's ailments with him or in his presence. To older children with cardiac disease, however, I explain as clearly as possible the nature of the illness, and insist that certain measures, particularly such as relate to restriction of activity, shall be carried out indefinitely. I find that in this way better coöperation on the part of the patients is secured than if they are simply given a list of dogmatic "don'ts." It is, furthermore, my custom, in cases showing aortic involvement or mitral stenosis, to advise what is known as "heart rest." Every day after the midday meal, with clothing off or loosened, the child should be made to rest in a recumbent position for at least one hour. During this time he may sleep or read, as best suits his individual taste.

Constructive Medication.—As most of the cases of valvular disease in children are of rheumatic origin, it will be found that the majority of the patients are suffering from a mild degree of anemia. All the benefits of good nutrition, fresh air, and regularity in living referred to under Tardy Malnutrition (p. 92), should be afforded these children. Iron alone or with arsenic is here of some value when given with a suitable diet. A method often followed is to give, for five days, the salicylate and bicarbonate of soda already referred to; for fifteen days iron and arsenic; and during the remaining ten days of each month no medication,

unless cod-liver oil is well borne, in which case this may well be given in combination with the extract of malt. If the patient can swallow a capsule, the following is given:

℞ Liquoris potassii arsenitis ..... gtt. xc
Extracti ferri pomati ..... gr. x
Quininæ bisulphatis ..... ʒj
M. ft. capsulæ no. xxx.
Sig.—One after each meal.

If the iron produces constipation, ⅓ to ½ grain of the extract of cascara may be added to each capsule.

Heart Stimulants.—Aside from such tonic medication, drugs affecting the heart itself should not be given unless compensation fails. This may take place temporarily, regardless of the nature of the lesion, after some forbidden exercise, or during an acute illness sufficient to produce prostration. Such failure may occur permanently in cases which, for any reason, do badly. In the event of defective compensation and dilatation the child should be kept in bed until the normal heart action is restored by rest, or until it is demonstrated that the aid of heart stimulants is required. In these cases, particularly in those of the latter type, when there is a rapid, irregular pulse, difficult breathing or excitement, and dropsy, the time-honored remedy, digitalis, is to be brought into use. For children I prefer to use the tincture. To a child from five to ten years old from 3 to 5 drops may be given after meals three or four times daily. This drug, because of its well-known irritant effects upon the stomach, should be given considerably diluted. Its beneficial effects will be apparent first in the relief of the dyspnea, the pulse becoming regular and of increasing volume; and later in the increased secretion of the kidneys and the disappearance of the edema. The amount of digitalis given should be reduced as soon as the condition will allow, but the medicine should be continued for a considerable time after the patient is up and about. The only contraindication to the use of digitalis in children is its effect upon the stomach. This is often so unfavorable that loss of appetite results, in which case the preparation should be discontinued. In this event the tincture of strophanthus, which is referred to repeatedly in this work as a heart stimulant, may be substituted in the same doses. In cases requiring a cardiac stimulant for a considerable time or permanently I have had satisfactory results by alternating the digitalis with the strophanthus, giving each for five days. The child, however, who requires constant cardiac stimulation promises but little for the future, and, in my experience, few patients of this type have survived the eighteenth year.

ADHERENT PERICARDIUM

As a result of an unresolved pericarditis with which a myocarditis may or may not have been associated, adhesions exist which bind the pericardium to the heart muscle, in most instances completely obliterating the pericardial sac. The condition is found in cases in which there

is extensive cardiac disease, such as hypertrophy, dilatation, and valvular involvement.

Diagnosis.—Diagnosis, if made at all, is usually made at the autopsy. The diagnostic sign of real differential value is a restriction of the chest-wall in the interspace corresponding to the apex-beat. Sometimes permanent cardiac friction-sounds may be heard, and there usually is an increase in the cardiac dulness.

ABUSE OF HEART STIMULANTS

Probably the heart stimulants, such as alcohol, strychnin, digitalis, and strophanthus, are given unadvisedly with greater frequency to children than is any other form of medication. If given needlessly, they are harmful indirectly, in that when the time for their use really arrives, the system has become accustomed to their action, and less benefit is derived from them. All forms of cardiac stimulants are of temporary value only. In some patients the stimulant effect of drugs will be exhausted more quickly than in others. The common practice of giving heart stimulants, simply because a child has pneumonia, typhoid fever, or diphtheria, is very bad. For giving these drugs to the best advantage, there should be one special indication and only one—the evidence of heart weakness. A very rapid heart, beating over 150 per minute in a sleeping child, may require help, for otherwise it may become exhausted because of the rapidity of its action. Pronounced weakness of the first sound and the accentuation of the second sound call for stimulation. When the heart action is irregular or intermittent, and when cyanosis develops, heart stimulants are called for.

X. THE BLOOD AND BLOOD DISEASES

BLOOD IN THE NEWLY BORN

According to Schiff, Perlin, Carstanjen, Scipiades, and Takasu, the blood of a new-born babe exhibits numerous characteristic changes.

1. The *specific gravity* averages between 1.060 and 1.080, but during the first two weeks rapidly sinks to its lowest point, at which it usually remains until the end of the second year of life, after which it rises until puberty, the average thus being between 1.050 and 1.055.

2. The percentage of *hemoglobin* is very high—usually between 100 and 140 per cent. of that found in the healthy adult.

3. The *red cells*, which are greatly increased, may number as high as 7,550,000, and usually above 5,000,000.

4. The *white cells* are also increased, in one case numbering 36,000.

5. According to Carstanjen, the polymorphonuclears number 73.4 per cent., as compared with 16.05 per cent. lymphocytes.

6. A large number of *nucleated red cells* are present up to the sixth day, after which scarcely any are to be found.

The variations noted become less marked after the fourth day. The number of polynuclear leukocytes diminishes, and after the fourth day the percentage of the various kinds of leukocytes is fairly constant during the first few months.

It is suggested that the many blood-changes observed in the new-born are due to lack of water, a considerable amount of which is lost through the intestine and in the form of perspiration.

BLOOD IN INFANCY OR CHILDHOOD

Hemoglobin.—Throughout the period of infancy and childhood the hemoglobin is lower than in the adult, its minimum being usually reached between the third month and the second year. From this point it gradually increases until puberty. The average hemoglobin of childhood is between 65 per cent. and 85 per cent., the former being considered a low limit for a healthy child.

Red Cells.—The average number in infancy is from 4,000,000 to 5,500,000, and in later childhood from 4,000,000 to 4,500,000 (Hayem). In the blood of the fetus and in premature infants nucleated cells are seen, but in later infancy their presence must always be considered pathologic. Formerly their occurrence even in healthy children was considered the rule.

Normal White Corpuscles.—In health the following varieties are found:

1. *Lymphocytes.*—These cells are smaller (5 to 8 microns in diameter), or larger (8 to 10 microns), than the red blood-cells. The nuclei are

relatively large, round, deeply stained, centrally placed, and contain one or two nucleoli. The cells may be deeply notched, especially the smaller ones, and even suggest polymorphonuclear cells, but are never identical in appearance. The protoplasm forms a narrow rim around the nucleus and is sometimes reticulated. The nucleus stains with basic dyes more faintly than the protoplasm. The larger cells of this group have an irregularly staining nucleus with a chromatin network and a margin of faintly granular protoplasm. The lymphocytes constitute from 40 to 60 per cent. of the leukocytes in the normal infant's blood.

2. *Large Mononuclears.*—These are not polymorphous cells, but contain a single round or large oval nucleus, and are usually two or three times as large as red blood-cells. The protoplasm is homogeneous and relatively large in amount. These cells constitute about 4 to 6 per cent. of the leukocytes.

3. *Transitional Cells.*—These are usually larger than the large mononuclears, which they closely resemble; in fact, they are the largest cells of the blood. They possess a "wallet" or "saddle-bag" nucleus. During the first few months they comprise 8 to 10 per cent. of the white cells (Carstanjen, Karnizki).

4. *Polymorphonuclear Neutrophiles.*—These cells, which constitute from 18 to 40 per cent. (Emerson) of the child's blood, are somewhat smaller than the transitional cells. The nucleus is characterized by its polymorphous nature and its deep stain, while its protoplasm is well filled with neutrophile granules, which may cover the nucleus.

5. *Eosinophiles.*—These are usually of the same size as the preceding, and occasionally a little larger. The nuclei are fairly well stained, while the protoplasm is filled with large eosinophilic granules. These cells constitute 2 to 4 per cent. of the normal white cells.

6. *Mast Cells.*—These are about the same size as the preceding, but frequently smaller; they have a trilobed nucleus and a protoplasm containing many large basophilic granules; often they are metachromatic. Their proportion is about 0.5 per cent. of the white cells.

Leukocytes Found in Pathologic Conditions.—

1. *Myelocytes.*—While any cell of bone-marrow is, strictly speaking, a myelocyte, by this term is generally meant one with a round nucleus and a granular protoplasm. Neutrophilic and eosinophilic myelocytes occur. Their size varies from that of the large mononuclears to that of red corpuscles. The nucleus is round, oval, and sometimes kidney-shaped, but never polymorphous; it is usually centrally placed, and is not stained diffusely by any good nuclear dye. The protoplasm may contain many or few granules of the neutrophilic type.

2. *Eosinophilic Myelocytes.*—These resemble the polynuclear eosinophiles, except for the rounded, undivided nucleus.

In pathologic conditions the leukocytes undergo various degrees of degeneration, both acute and chronic. There may be swelling, fragmentation, and hydropic and fatty degeneration, with nuclear changes.

According to Rieder, the leukocytes average from 8700 to 12,400

between the second and fourth days; after the fourth day, from 12,400 to 14,800. In infancy the variations are from 9000 to 14,000; in later childhood, from 6000 to 12,000. When the second year is reached, the blood gradually begins to assume the adult type. This, however, is not attained until the fifteenth or sometimes the twentieth year. Up to the sixth year there is a preponderance of lymphocytes. Sex makes no material difference until the fifteenth year. The blood-making organs of the infant are severely affected by disease. The infantile blood readily takes up myelocytes and nucleated cells (Zelenski-Cybulski).

Leukocytosis.—By this is meant an increase in the number of white corpuscles in the blood. It may be of two varieties—relative and absolute. A relative leukocytosis is more frequent in children than in adults. By the leukocytosis one may judge the nature of the reaction of the organism to bacteria or to the toxins in the blood elaborated by the bacteria concerned in the inflammation or infection. It may thus be seen that the reaction of the individual will depend upon two factors: (*a*) the severity of the infection and (*b*) the resistance of the individual. Of the two, the latter is more important. It is a fact that the most marked degree of leukocytosis is observed in a healthy, well-nourished child suffering from a severe infection; while, on the other hand, a feeble child suffering from the same infection will have a slight leukocytosis or probably none at all. The nature of the infection depends upon the character of the inflammatory process. Leukocytosis is less marked in serous and more pronounced in suppurative processes, while in both instances it is highest during the stage of active exudation. In well-localized suppurative inflammations there may be no leukocytosis at all.

Leukocytosis is present in a great many pathologic conditions, and in some cases the explanation is wanting. A satisfactory division of leukocytosis is into the two groups—(*a*) *physiologic* and (*b*) *pathologic*. By the former is meant that which follows a meal or exercise or that which occurs in the new-born; by the latter is meant that which may occur after serious hemorrhage, malignant disease, and various inflammatory and toxic conditions. Japha has not been able to demonstrate a genuine leukocytosis of digestion in the bottle-fed infant, and Greger did not even find it regularly present in the breast-fed infant. If, however, a breast-fed infant was given cow's milk, there was an immediate occurrence of leukocytosis and hence the opinion (Moro) that it is a reaction against foreign proteid. Children show a more pronounced digestive leukocytosis than adults, occasionally the increase amounting to one-third of the total number of leukocytes.

The chief form of leukocytosis in children is the inflammatory type. This is especially noticeable in acute pneumonia, diphtheria, acute rheumatism, erysipelas, scarlet fever, tuberculous meningitis, and in suppurative conditions of the subcutaneous tissues, serous cavities, bones, joints, and viscera. In these conditions the increase is chiefly in the polymorphonuclear neutrophiles.

In pertussis, hereditary syphilis, and certain diseases of the spleen there is a relative increase in the lymphocytes, while in leukemia, asthma,

helminthiasis, and some forms of chronic skin disease there is an increase in the eosinophiles.

There is usually no leukocytosis in typhoid fever, measles, rötheln, mumps, malaria, and uncomplicated tuberculosis not invading the meninges or serous surfaces. In the usual forms of gastro-enteritis leukocytosis is absent, while in "Finkelstein's alimentary food intoxication" it is pronounced.

THE BLOOD IN DIFFERENT DISEASES

Pneumonia.—In this disease there is regularly a leukocytosis, and it is in this illness that the inflammatory leukocytosis has best been studied. The leukocytosis here is an expression of the resistance of the organism to the infection, and depends but little on the fever and the extent of consolidation (Ewing). In an average case the count may vary between 15,000 and 40,000 or 50,000, and but rarely reaches 100,000; although there are a number of cases on record with a count as high as this. A high count gives no idea of prognosis; it means that the protective forces are making a vigorous fight, but gives no hint as to which will win, they or the infection. Absence of leukocytosis is usually of bad import, and shows that the patient has low resistance; and a rapid fall with either a low or a high temperature is usually indicative of a loss of resistance on the part of the patient. The fall in the count begins just before, just after, or with, that of the temperature, and may be by the maximum count; this diminution usually corresponds to the change in temperature. If the count remains elevated, delayed resolution, empyema, or abscess should be suspected. The increase is mainly in the polymorphonuclear cells, which may vary from 60 to 90 per cent. of the total leukocytes. In pneumonia following pertussis the increase is chiefly in the lymphocytes. The absence of a leukocytosis in a strong, well-nourished child who is very ill is always strong presumptive evidence against pneumonia. The changes in the red cells and hemoglobin are those of a secondary anemia, depending on the duration of the disease and the resistance of the patient.

Leukocytosis is present in both forms of pneumonia in infancy and childhood, but is more marked in the lobar form, the number of leukocytes to the cubic millimeter being about twice as many as in the catarrhal types. There is marked leukocytosis in the fatal cases of both forms of pneumonia (Koplik).

Empyema.—Marked leukocytosis is almost invariably present with a high polymorphonuclear count—usually from 75 to 90 per cent. In cases of long standing there is often no leukocytosis, but the polymorphonuclear count remains elevated. In tuberculous effusions the count is usually low, with no increase in the polymorphonuclear count.

Influenza.—Uncomplicated influenza has no leukocytosis. Influenzal pneumonia ordinarily has a leukocytosis of from 15,000 to 20,000. To date no uniform conclusions have been arrived at concerning any characteristic change in the differential count other than that of an ordinary pneumonia.

Tuberculosis.—In tuberculosis, in general, there exists a mild grade of chlorotic anemia with little or no leukocytosis. The count is nearly normal, while the hemoglobin is somewhat reduced. In other cases there is a lymphocytosis, absolute or relative. If a secondary infection occurs, which is not infrequent in infants and young children, leukocytosis is the rule, and, in fact, Limbeck considers the presence of a leukocytosis sufficient guarantee of a secondary infection. In case of pneumonia the leukocytosis is as high as in the ordinary croupous pneumonia. Various observers are of the opinion that in incipient tuberculosis there is a slight increase in the eosinophiles, and that, as the infection progresses, they diminish. From a series of 182 blood examinations of tuberculous patients Solis Cohen concludes that an increase in the polynuclear count points toward an advance of the disease and vice versâ. In tuberculous bronchial adenopathy and peritonitis, leukocytosis is absent, although in the latter Cabot reports an increase in the cell count in 14 out of 60 cases. Tuberculous meningitis regularly causes a leukocytosis, reaching at times as high as 50,000, while there is usually a polymorphonucleosis, in some instances as high as 90 per cent. of the total white cells. In bone and joint disease the leukocytes are normal or very slightly increased, and only during abscess formation or following operation is there an appreciable increase in the cell count.

Typhoid.—As in adults, there is a low white cell count, generally under 10,000. The lymphocytes are slightly increased, and there is usually a mild grade of anemia.

Rheumatism.—There is regularly a leukocytosis and a severe grade of secondary anemia.

Peritonitis and Appendicitis.—In the former there is a polymorphonuclear leukocytosis. This, however, is wanting in some cases of the severest type. In a series of 70 cases of appendicitis in children reported by Fowler in 1912, the average leukocyte count was 19,106, the average polynuclear, 79.7 per cent.; the highest leukocyte count was 48,200; the lowest, 8200; the highest polynuclear count, 92 per cent.; the lowest, 63 per cent.

Meningitis.—In cerebrospinal meningitis and in meningitis caused by the other pyogenic organisms there is regularly a leukocytosis with an increase in the polymorphonuclears. The leukocyte count is of no value in distinguishing the various forms of meningitis, since it is also present in the tuberculous form (Emerson).

Poliomyelitis.—Until a monograph on poliomyelitis by Draper, Peabody, and Dachez, of the Rockefeller Institute, was issued, a number of conflicting statements had been made concerning the blood findings in this disease. Previous to this clinical study by the above authors, Müller in Germany, and La Fetra in New York, had made the most extensive observations. The latter reported a leukocytosis between 13,400 and 20,600, while Müller found a leukopenia in the acute stage. Draper, Peabody, and Dachez tabulated their findings in 59 hospital cases, and came to the conclusion that in the preparalytic stage the counts varied within the normal, but that there was a tendency toward

a leukocytosis. In the acute stage, in every case except one in which leukopenia existed, there was a marked leukocytosis, in several instances reaching as high as 30,000. In addition to this increase in the white-cell count they found a constant increase in the polymorphonuclears of 10 to 15 per cent. and a diminution of lymphocytes of 15 to 20 per cent. The other white cells showed no abnormalities. In view of these findings a definite leukocytosis with an increase in the polymorphonuclears and a corresponding diminution of the lymphocytes is additional evidence, when considered with other available signs, in favor of the disease in question,

Eosinophilia.—*Asthma.*—In true bronchial asthma the eosinophiles may be from 10 to 20 per cent. Cases are reported with eosinophilia as high as 50 per cent. Holt gives 10.7 per cent. as the average in a series of cases examined in his clinics by Wile; the highest was 26 per cent. The presence of an eosinophilia serves to distinguish the attack from one of acute bronchitis or tuberculosis. The occurrence of an increase in the eosinophiles apparently determines the asthmatic character in certain spasmodic attacks of the respiratory system in infancy.

Eczema.—There is no difference between the number of eosinophiles in infancy and childhood and that in adult life. Occasionally an eosinophilia is noted in pemphigus.

Parasites.—Any parasite, from the harmless pinworm to the most malignant uncinaria, may cause eosinophilia. It is not always present, nor does its degree bear any relation to the severity of the infection or the danger of the parasite. The presence of an eosinophilia in a child should always make one suspicious of intestinal worms. Amberg, in amebic dysentery of children, found a slight increase in the eosinophile count. The average number of these cells in parasitic diseases is from 4 to 10 per cent. of the total white-cell count, but these figures may be exceeded. In not a few cases symptoms of pernicious anemia have been present, and a severe grade of secondary anemia may exist.

In a recent case of trichinosis the eosinophile count was 72 per cent.

Syphilis (Congenital).—There is usually a relative increase in the mononuclear cells and a severe secondary anemia, while a case with a severe rash, especially involving the face, may develop an eosinophilia as high as 23 per cent., diminishing as the condition improves.

Gastro-enteritis.—In this disease there is usually no leukocytosis, although in some cases a slight increase may be noted. It is remarkable that even in long-standing cases of gastro-enteritis, enterocolitis, etc., there is not a great reduction in hemoglobin.

In Finkelstein's "Food Intoxication" one of the cardinal signs is a leukocytosis of from 20,000 to 40,000, the largest cell percentage being of the polymorphonuclear variety.

Infectious Diseases.—*Whooping-cough.*—In this disease the leukocytes are increased to three or four times the normal amount, averaging 40,000 (Emerson). The change is more pronounced the younger the child. The early appearance of a leukocytosis is important in diagnosis. The increase is chiefly in the lymphocytes, which may constitute from 60 to 80 per cent. of the total white count.

According to Fröhlich and Muenier, the leukocytosis of pertussis far exceeds that of any other afebrile disease of the respiratory tract. The leukocytosis occurs in the early part of the convulsive stage, disappears with improvement, and does not seem to be influenced by complications.

Measles.—Hecker (Zeitschrift für Kinderheilkunde) records the results of his blood examination of 14 children. In the incubation period his observations were uniform, and he concluded that during the incubation period, and occasionally extending into the eruptive period, there existed—(1) A leukopenia; (2) a relative lymphocytosis; (3) reduction in the number of eosinophiles. In 13 cases in the prodromal period Platinger found a neutrophile hyperleukocytosis of even 20,000, which rapidly gave place to a hypoleukocytosis during the eruptive stage. Holt states that there is a leukocytosis of 15,000 to 30,000, beginning soon after infection and increasing for four or five days. A marked increase in the leukocytes during the illness usually points to a complication. Hektoen, in his animal experimentation and observation on human beings, found that there was a preliminary leukocytosis, followed by a leukopenia, chiefly of the polymorphonuclear neutrophiles, the lymphocytes being relatively increased.

Diphtheria.—In this disease there is a moderate anemia, a loss of about 2,000,000 red cells at the time of defervescence (Emerson, Ewing). The reduction in the hemoglobin is usually proportionate to the reduction in the red cells. There is usually a slight leukocytosis, ranging, as a rule, from 10,000 to 15,000, but in severe cases the white cells may number 17,000, and with complications, 30,000 (Emerson). The rise is in the polymorphonuclear cells. According to Engel, the myelocytes are increased, especially in the fatal cases, from 3 to 16 per cent. Morse says, "The examination of the blood in diphtheria is of no practical clinical importance in diagnosis, prognosis, or treatment."

Scarlet Fever.—Scarlet fever produces little change in the red blood-cells, but does cause a slight anemia (Reckzan), the average drop being 1,000,000. There is uniformly a leukocytosis, beginning in the incubation period and continuing into convalescence (Emerson). The leukocytes vary from 10,000 to 40,000; in mild cases from 10,000 to 20,000; in moderate cases from 20,000 to 30,000; in severe cases from 30,000 to 40,000, while Holt states the number may be as high as 75,000. The variation is according to the severity of the case. The increase is chiefly in the polymorphonuclear cells, which may constitute 85 to 98 per cent. of the total count, especially in severe and sometimes fatal cases. At first there is a complete disappearance of the eosinophile cells, and, later, a rapid increase (20 per cent.). The disappearance of the eosinophile cells during the course of the disease is a bad prognostic sign, and absence of leukocytosis is also ominous.

In the Centralblatt für Bakteriologie of November, 1911, Döhle reported, in 30 cases of scarlet fever, certain inclusion bodies found chiefly in the leukocytes. More recent work by Nicoll, of New York, and Kolmer, of Philadelphia, has shown that these bodies are present in

streptococcus infections, and the latter reports their presence in 42 per cent. of diphtheria cases. The inclusion bodies are present in 94 per cent. (Kolmer) of scarlet-fever cases during the first three days; after this they diminish in number, and are generally absent after the ninth day. Thus, while their diagnostic value is necessarily limited, their presence may be useful in the differential diagnosis of scarlet fever, rötheln, measles, and gastro-intestinal rashes.

Congenital Heart Disease.—Of congenital affections, this disease presents the largest number of cases of polycythemia, although, as Osler states, "polycythemia is not a constant feature in congenital cyanosis. It is characteristic rather of the later stages of the disease, and its appearance is said to be of unfavorable prognosis." Vaquez and Quiserne state their belief that when the polycythemia reaches 6,000,000, it seems to be fatally progressive, evidencing a more and more insufficient aëration, the prognosis becoming correspondingly graver. The red cells frequently reach 6,000,000 to 7,000,000, and the percentage of hemoglobin may be as high as 160, and the specific gravity 1070; naturally the blood-clot is greatly increased, owing to the excess of red blood-cells. Cautley reports a case of polycythemia of 10,000,000, and Still one of 9,280,000. The white blood-cells are not increased.

BLOOD-PRESSURE IN CHILDREN

During the past few years numerous observations of the blood-pressure in different diseases have been made by Rolleston, Sergeant, and Hutinel abroad, and by Howland and Hoobler in America.

Probably the simplest and most easily handled machine of the Riva-Rocci type is the Faught, with a cuff made from an ordinary Vorhees uterine dilating bag. With this combination, the smallest arm can be readily accommodated. An exact estimation of the pressure is not always possible on account of the small size of the radial artery and the overlying thick pad of fat, which makes palpation rather difficult, and especially so when the infant struggles, as is not infrequently the case. The Faught instrument gives readings usually from 5 to 10 mm. higher than other sphygmomanometers, and in practically every instance the personal equation is an important factor.

Hoobler, of New York, has recently improved upon the pith-ball arrangement, so that it automatically and visibly indicates both systolic and diastolic pressure, thus enabling one to eliminate variations due to the personal equation, which different observers have shown to be considerable.

According to Kolossowa, Oppenheimer, and Bauchwitz, the following figures may be considered normal:

Age, Years	Mm. of Mercury
1–2	75–85
3–4	85
5–7	90–95
8–10	95–100
11–13	100–110

All febrile diseases tend to lower the blood-pressure. During the past few years Comby, Hutinel, and Rolleston have found a constant hypotension in scarlet fever and diphtheria, more pronounced in the former. These authors consider a severe degree of hypotension to be of bad omen, especially in scarlet fever, and they believe that this condition should be met by the exhibition of adrenalin hypodermically.

Among other causes of hypotension, Janeway enumerates hemorrhage, collapse, and the action of poisonous drugs, especially chloroform.

Howland and Hoobler, in a series of observations, found that fresh air in pneumonia tended to raise the blood-pressure, and that removal of the patient to room temperature produced a corresponding fall. This rise in pressure was apparently beneficial in every case. The blood-pressure changes were not so pronounced in those convalescing from the disease. The value of blood-pressure estimation in epidemic meningitis during intraspinal injections of serum has already been mentioned.

Increased blood-pressure is furthermore observed in conditions of acute cerebral compression and anemia and in acute nephritis complicated by uremia.

COAGULATION TIME

The great diversity of opinion on the normal coagulation time and also in various diseases has no doubt been due to the variety of instruments employed; however, the best results obtained have been those of Rudolf—8.1 minutes—and Carpenter—9.5 minutes—working with different instruments.

Owing to these wide variations, despite careful technic and regulation of apparatus, no constant results have been obtained. From a rather exhaustive study Carpenter and Gittings conclude that it is improbable that any important variation exists in the coagulation of the blood in diseases other than those of the so-called hemorrhagic type. This opinion may be qualified by the statement that average differences of one, two, or three minutes can hardly be construed as of any practical importance, inasmuch as a difference of from five to twelve minutes has been found in typhoid fever by authoritative observers.

ANEMIA

Simple anemia is usually a secondary condition, and is not at all infrequent in children. A vast majority of the cases coming under my observation are those of children of the runabout age, and older children who are suffering from tardy malnutrition, having been badly fed and having wasted their energy in different ways. Simple anemia may be the result of hemorrhage, as in hemorrhagic disease in the newly born and in purpura, particularly purpura fulminans (Henoch's). In the average case of anemia in my own work the hemoglobin ranges from 40 to 50 per cent., and the red cells from 3,500,000 to 4,000,000. Children suffering from tuberculosis and syphilis usually show a secondary anemia. It is also temporarily present after pneumonia, scarlet fever, diphtheria,

and typhoid fever, and similar diseases which have severely taxed the organism.

I have seen a great many cases in runabout children under three years of age, for whom the milk diet had been continued as the almost exclusive means of nourishment. Children of the poor, because of the defective feeding and housing, are frequent sufferers.

Symptoms.—The chief symptom is that of weakness. The appetite is usually indifferent, and the bowels are constipated. Such children tire readily and are unable to keep up with their fellows at play or in school. They sleep poorly and, as a rule, are irritable and unhappy. In appearance they are apt to be pale and thin, although this is not invariably the case, as I have repeatedly seen severe anemia in plump children.

Illustrative Case.—The most pronounced case coming under my care was that of a boy of six years who weighed 46¼ pounds. The blood examination showed: hemoglobin, 18 per cent.; red cells, 660,000. In two weeks the hemoglobin was 20 per cent.; the red cells, 640,000. Five weeks after first examination, the hemoglobin was 30 per cent.; red cells, 1,172,000. The blood examination was checked up by a second person. No further improvement has taken place after one year of treatment. It is impossible to raise the blood above 30 per cent. hemoglobin and 1,500,000 red cells.

Anemic murmurs may be heard over the heart, but this has been unusual in my cases. In the case referred to, the heart-sounds were normal. The spleen is not often found enlarged.

Examination of the blood in this disease (or symptom) enables one to estimate with accuracy the severity of the process. In mild cases there may be only a reduction in hemoglobin, and the blood may assume the chlorotic type. There is, in addition, a reduction in the specific gravity, depending on the degree of anemia, and if the primary affection, like pneumonia, causes an increase in the leukocytes, there will be a leukocytosis. In the cases of moderate severity the red cells may range between 3,500,000 and 4,000,000, and the hemoglobin from 40 to 60 per cent. In severe cases the red cells vary from 2,000,000, or a little less, to 3,000,000. There is a corresponding reduction in the hemoglobin, but cases have been reported with a hemoglobin as low as 15 per cent. In the boy referred to above, the hemoglobin at 18 per cent. was the lowest coming under my observation. The more marked the reduction in red cells and hemoglobin, the more marked will be the poikilocytosis and polychromatophilia, and the greater the number of normoblasts and megaloblasts. In the severe cases myelocytes may be present. There is no increase in the eosinophile cells. In the severe secondary anemias, the physical characteristics of the blood are very striking. It may be so thin as to separate on puncture into a reddish and a colorless portion, resembling beef-water (Koplik).

The **prognosis** is good in the cases in which syphilis and tuberculosis are absent. In fact, the great majority of the cases respond most satisfactorily to properly directed treatment.

Treatment.—The management consists in placing the child in a normal child's environment, which includes the giving of suitable food.

The treatment described under Tardy Malnutrition (p. 92) covers these cases.

In pronounced cases transfusion offers the most prompt results.

CHLOROSIS

Chlorosis is a form of anemia most frequently seen in young girls at the time of puberty or later. The cause of the condition is not known. Various theories have been advanced, none of which can be proved. The most plausible theory assumes the existence of a persistent intestinal intoxication. That such is a probable cause has been suggested in my cases. The more pronounced changes occur in the specific gravity of the blood, and correspondingly in the hemoglobin, both of which are reduced out of proportion to the reduction in red cells, although in severe cases the red-cell count may fall to 1,000,000. In ordinary cases the corpuscles vary between 3,000,000 and 4,500,000, while the hemoglobin may be as low as 30 per cent. There is no leukocytosis, but microcytosis, poikilocytosis, and polychromatophilia are usually present.

Symptoms.—The symptoms are quite characteristic. The patient is habitually tired and incapable of unusual or prolonged exertion. The skin is of a peculiar sallow, greenish color. The hands and the feet are cold. Amenorrhea is almost always noted in girls who have passed the period of puberty. I have known the menses to be discontinued for a year. The appetite is capricious, and the patient craves most unsuitable articles of food and substances not in the food class. The history usually includes the story of habitual constipation which was never treated.

Anemic heart murmurs and the venous hum over the vessels of the neck are usually present. The patient is nervous, irritable, and not infrequently hysteric. I have seen one pronounced case of hystero-catalepsy in a young girl with chlorosis.

Prognosis.—While this condition is usually obstinate, the outcome in my cases has always been favorable.

Treatment.—The management consists in the correction of the constipation and in the provision of suitable food at definite intervals. Eating between meals must not be allowed. Stress, both physical and mental, is to be avoided. Iron and arsenic are of value. The following combination of drugs has served me well:

℞ Strychninæ sulphatis ..... gr. $\frac{1}{4}$
Acidi arsenosi ..... gr. $\frac{1}{5}$
Extracti ferri pomati ..... gr. vj
Extracti cascaræ sagradæ ..... gr. xxx
Chiniæ bisulphatis ..... gr. lx
M. ft. capsulæ no. xxx.
Sig.—One after meals.

The amount of cascara prescribed depends upon the degree of constipation.

After the diet and the bowel habit have been satisfactorily adjusted, the patient should be given a change of environment. I know of nothing

so conducive to a reasonably prompt cure as an absolute change in the daily life of the patient.

Entertainment and amusements which do not excite or overtax are to be encouraged. The cure will be aided by removal of the patient from the association of persons who are not congenial.

PSEUDOLEUKEMIC ANEMIA OF VON JAKSCH

In this affection there is marked anemia with enlargement of the spleen. The condition was first described by von Jaksch, who believed it to be a clinical entity. The disease represents an unusually severe type of secondary anemia, and is of toxic origin, the nature of which is not understood.

There are no valid grounds for believing so rare a disease to be dependent upon rachitis or syphilis. Syphilis and rachitis occur with the greatest frequency. If these diseases were causative factors, it is reasonable to suppose that there would be many more cases. The great majority of the cases follow prolonged intestinal disturbance and malnutrition.

Pathology.—The pathologic changes comprise enlargement of the spleen and moderate swelling of the lymph-nodes, with a diminution in the specific gravity, the hemoglobin, and the number of red cells in the blood, and an increase in the leukocytes.

The Blood.—The number of red cells is frequently as low as 2,000,000. It may fall to 800,000. The color index is low. The hemoglobin reduction is very great, and may reach 30 per cent. (Emerson, Comby, Cautley). There is always a leukocytosis of from 20,000 to 50,000. In one case reported by Emerson the leukocytes numbered 114,000, and in another, at the Babies' Hospital, 96,000. They may show an increase in the mononuclear or polynuclear forms. The eosinophiles are usually increased, but may be normal or diminished. The white cells exhibit great variety in size, shape, and staining properties. Mast cells and myelocytes in small numbers may be found. Karyokinesis is common, and is regarded by some observers as of diagnostic importance (Comby). The red cells include many microcytes, myelocytes, normoblasts, and megaloblasts, and show, in addition, poikilocytosis and polychromatophilia.

Symptoms.—The symptoms are those of progressive, pronounced anemia in a child usually well nourished. Emaciation may develop later in the disease. The patient becomes very weak and his activities cease.

The appetite is often greatly impaired, and food, if urged, is apt to be vomited. In the later stages hemorrhages from the mucous surfaces may occur. Petechiæ are common. The lymph-nodes show moderate enlargement.

Fever is occasionally present, usually due to intestinal conditions.

Probably the best recent discussion of this condition is that of Cabot, who thinks that the many very different cases thus diagnosed cannot be grouped together.

Prognosis.—The prognosis is very unfavorable. Death in the fatal cases takes place from intercurrent disease. Patients who exhibit improvement for a time usually succumb later.

Treatment.—The management is entirely supportive. Iron and arsenic may be given in the hope that they will be of some benefit.

LEUKEMIA

Leukemia is a disease marked by the constant presence in the blood of granular mononuclears, or an increase in the blood of the non-granular cells with round nuclei—the miniature cells of the blood-building organs, which are not normally present in the peripheral circulation. There is also a decided change in the blood formula. Generally there is a marked increase in the leukocytes, and yet there are instances when the count is normal and the diagnosis is made from the increase of abnormal cells.

Splenomyelogenous Leukemia.—In this disease there is a great increase in the granular cells, more especially the polymorphonuclears, eosinophiles, and basophiles, and also in the cells with spheric or slightly indented nuclei (Emerson). The total blood is increased in the majority of instances and diminished in few. In a great many cases the blood may appear to the eye normal; in extreme cases it is pale, opaque, and flows sluggishly.

The red cells are greatly reduced in number—occasionally as low as 2,000,000. Poikilocytosis is present in all cases; microcytosis and macrocytosis are rare, while polychromatophilia is usually present.

This is the condition par excellence in which normoblasts are present in abundance. In many cases megaloblasts are found. The hemoglobin is much reduced.

The white cells vary from 100,000 to 500,000 (Holt), or, as mentioned before, may be normal in number. Neutrophiles are absolutely diminished, but relatively increased. The lymphocytes are increased, but vary according to the stage of the disease. Eosinophile myelocytes are found, and there is an absolute increase in the eosinophiles. Ehrlich states that in this disease there is always an increase in the basophiles, and Cornil's myelocytes are present.

Lymphatic Leukemia.—In the lymphatic type there is a marked increase in the mononuclears. Despite the name, the increase is not always in the lymphocytes, although this increase is most usually in the small mononuclears, which in some cases have been known to form 90 per cent. of the total white cells. Polymorphonuclears are rare. Eosinophile cells are noticeably absent, and in a pure case myelocytes are not present. There is a greater anemia in this form than in splenomyelogenous leukemia.

In a review by Churchill (1904) the lowest red-cell count reported was 750,000 after a severe hemorrhage, and the leukocytes varied from 6000 to 810,000 (in a twenty-months'-old child). In a case reported by Wollstein from personal observation there were 99 per cent. of small mononuclears, many of which were degenerated.

Etiology of Leukemia.—Leukemia is rare in childhood. Its cause is unknown.

Morbid Anatomy.—The bone-marrow is always changed: in acute lymphatic leukemia it is red or gray, with an increase mostly in the lymphocytes. In myelogenous leukemia the marrow is red, grayish white, or greenish, with an increase in the myelocytes.

The *spleen* is enlarged in all forms of leukemia, and may be enormous in size.

Adenoid tissue throughout the body is hyperplastic.

The *liver* is enlarged, and contains many small grayish or yellowish areas which are collections of leukocytes.

The *lymph-nodes* are always enlarged in lymphatic leukemia, and may be enlarged also in the myelogenous form. The cervical, axillary, and inguinal nodes may form masses as large as an egg or even larger. These masses are soft, painless, and not adherent to the skin.

Leukemic infiltrates or *lymphomata*, circumscribed or diffuse, consisting of masses of lymphocytes, may be present in the kidneys, lungs, skin, peritoneum, dura, myocardium, pancreas, etc.

Illustrative Case.—A boy, four years of age, weighing 33 pounds, was referred to me by Dr. Brooke, of Bayonne, N. J. For nine months there had been a gradual abdominal enlargement, with pallor and gradually increasing weakness. The spleen was enormously enlarged, extending 1 inch above the pubes and 1½ inches to the right of the umbilicus. Examination of the blood showed: Hemoglobin, 35 per cent.; red blood-cells, 2,000,000; white blood-cells, 760,000; myelocytes, 61 per cent.; polynuclears, 41 per cent.; lymphocytes, 10 per cent. Benzol, in two minim doses (in emulsion), three times daily, was given for six weeks, at which time the boy showed marked improvement. The appetite was much better. He was more active. The general appearance was decidedly better. The spleen had appreciably decreased in size. The blood examination showed that the general betterment was consistent: Hemoglobin, 48 per cent.; red blood-cells, 3,728,000; white blood-cells, 272,000; myelocytes, 27 per cent. The improvement was entirely unexpected. The case is under observation at the time of writing, and the outcome will be watched with much interest.

Prognosis.—The prognosis is most unfavorable. Few patients survive one year of the disease. Reported recoveries probably mean errors in diagnosis. Death usually takes place from intercurrent disease.

Treatment.—Nutritional measures should be brought into use. Iron, arsenic, and cod-liver oil are usually employed. Recently Dr. Frank Billings, of Chicago, has employed benzol with benefit in five adult cases.

The above case is the only instance in which I have employed this drug. The results warrant further observation in its use.

PERNICIOUS ANEMIA

Pernicious anemia in infants and young children is very rarely seen. In fact, its existence in children has been questioned, for blood states described as peculiar to pernicious anemia have been found in other diseases, as in rachitis and syphilis, in which there is extreme anemia. On the other hand, cases of primary pernicious anemia have been reported by observers of repute sufficiently often to establish the disease as an entity.

Lesions.—In pernicious anemia there is extreme general pallor, and fatty degeneration of the heart muscle, the liver, the pancreas, the gastro-intestinal epithelium, and the kidneys. In addition, hemosiderosis is present in the liver, spleen, bone-marrow, and kidneys, due to the destruction of red blood-cells. Capillary hemorrhages into the viscera are rarely lacking, and are especially frequent in the nervous structures and in the serous membranes. The color of the bone-marrow may be changed from yellow to red, and microscopically shows many megaloblasts.

The Blood.—The specific gravity and coagulability are much reduced, and the hemoglobin may be as low as 20 per cent. In the fresh specimen, rouleaux formation is absent, and the cells vary much in size and shape, extreme poikilocytosis being the rule. A large increase in the megalocytes, with absence of microcytes, is very suggestive of the disease in question. Owing to the relatively high content of hemoglobin, the red cells stain fairly well and uniformly, but in many cases there is a degeneration with accumulation of hemoglobin in the center of the cell. The megaloblasts usually outnumber the normoblasts.

In severe and uncomplicated cases there is always a leukopenia, and the polymorphonuclear count is roughly parallel to the leukocyte count. Myelocytes are usually present.

Symptoms.—The symptoms are those of rapidly progressive, high-grade anemia. The chief symptoms are pallor and marked exhaustion. The patient is intensely prostrated. Emaciation is not of constant occurrence. Petechiæ and submucous hemorrhages occur. The duration of the disease is but a few months, and the true cases are fatal.

PURPURA

By purpura is understood a condition in which the blood either escapes from its natural channels and constitutes a hemorrhage, or becomes localized in different portions of the skin and subcutaneous tissue, with no constant change in its character or demonstrable lesion in the vascular walls.

Simple Purpura.—Simple purpura occurs in the form of petechiæ, often as a terminal symptom in exhausting diseases. It may result from severe vascular strain, as in pertussis. I have seen several such cases. Purpura is a prominent symptom in scorbutus and peliosis rheumatica. It may occur as a direct effect of poisonous drugs. Thus in my own cases it has resulted from accidental large dosage of phosphorus and antipyrin. In a vast majority, if not all, of the cases the condition is due to toxic agencies originating within the body or introduced from without.

The Hemorrhagic Type.—The distinction between simple and hemorrhagic purpura is largely one of degree. In the hemorrhagic type there are free hemorrhages from different portions of the body, usually associated with extensive subcutaneous hemorrhage or hemorrhages into different organs. Massive hemorrhages have been designated as purpura fulminans, or Henoch's purpura, and here again the differentia-

tion is based upon the severity of the condition and involves an unnecessary classification.

The hemorrhage and its persistence depend upon the nature of the infection and the resistance of the individual.

Illustrative Cases.—One of my patients, two years of age, developed a mild purpura while taking large doses of antipyrin, which was being administered as the result of a misunderstanding. In *pyemia*, purpura is not unusual. In a patient nineteen months of age, who died from a septic sinus thrombosis with extension to the jugulars, there was extensive purpura for forty-eight hours before death. Blood examinations made from this patient during life showed pure cultures of streptococci. Another patient, a boy eight years of age, previously healthy, died in three days from *purpura fulminans* (Henoch). Death resulted from extensive hemorrhages under the skin, combined with hemorrhages from the nose, mouth, and intestines, and presumably the viscera. An autopsy was not allowed. In this case also blood cultures made postmortem, from subcutaneous hemorrhagic areas, showed pure growth of streptococci.

A notable case was that of a boy seen in consultation with Dr. Corwin, of Rye, N. Y. The family history was negative. The tonsils and adenoids were removed six months before the illness, without more than the usual bleeding. Two months before the illness the boy fell and broke off an incisor tooth. No bleeding followed the accident. On June 15, 1910, the patient was taken ill with tonsillitis. The temperature ranged from 100° to 102° F., and continued for one week. During this time numerous subcutaneous hemorrhages appeared at various sites over the body, particularly on the leg. A large hematoma developed in the abdominal wall. There was some bleeding from the gums, and the subcutaneous hemorrhages continued to appear on the chest, abdomen, and legs. There was moderate bleeding from a bicuspid tooth. The child was given calcium lactate in small doses, three grains every three hours. The hemorrhage from the gum stopped, and the subcutaneous hemorrhages began to show signs of absorption.

On July 7th, a little over two weeks after the first sign of the purpura, there was a hemorrhage from the nose which lasted about an hour. On the following day there was another hemorrhage from the nose which lasted five hours, resisting all ordinary methods of control. The patient was at this time seen by me. He evidently had suffered much from loss of blood. The eyes were sunken and the skin was pale and sallow and showed in many areas the evidences of the previous subcutaneous hemorrhage. The child was markedly prostrated. Calcium lactate was resumed in 10-grain doses every two hours. On account of the greatly reduced condition of the patient, normal salt solution was given by the drop method through the tube introduced into the colon. The stools at this time consisted largely of coagulated blood.

July 9th the hemorrhage appeared to be controlled. Twenty grains of calcium lactate were given every two hours.

July 10th nasal hemorrhage began at 5 A. M. and continued for five hours. Saline irrigation returned blood-stained. The child was now in an extreme condition, and 30 c.c. of the human serum were injected subcutaneously by Dr. J. E. Welch. During the remainder of the day from 45 to 60 c.c. of the human blood-serum were injected at two-hour intervals until midnight. The amount injected in twelve hours was 290 c.c. In the evening there was an evacuation of the bowels, composed entirely of coagulated blood

July 11th the stools contained blood, and the expectoration contained some bright red blood. There was a moderate nasal hemorrhage. At 8 A. M., 3 P. M., and 9 P. M., 167 c.c. of human blood-serum were given in three doses.

July 12th there was no visible hemorrhage from any portion of the body. Four injections of the blood-serum were used, the total amount being 191 c.c.

July 13th, 14th, and 15th three injections of the blood-serum were given at about six-hour intervals, in quantities ranging from 20 to 30 c.c.

July 16th two injections of the serum were given, at twelve-hour intervals,—44 c.c. in all,—and on July 17th one injection of 35 c.c. was given. The total amount of serum given during the one week of treatment was 1034 c.c.

From this time the child manifested a slow but steady improvement, and eventually made a perfect recovery. It was of interest to note that the hemorrhage, which had continued intermittently for nearly three weeks, ceased within fifteen hours after the first injection of human serum. While the treatment with the serum was being carried on the child was kept alive by predigested foods and free stimulation.

For obvious reasons, a blood culture was not made. Without doubt there was a bacteremia with resulting blood changes which the human serum was able to control.

In the two years that have intervened there has been no hemorrhage nor any suggestion of bleeding from any portion of the body.

Apparently here was a case in which, beyond all possibilities of doubt, the use of the human blood-serum saved the life of the child.

Prognosis.—The prognosis in the simple cases is good. The phosphorus-poisoning case was fatal, but not alone owing to the hemorrhage. In hemorrhagic cases of severe type the outcome appears to depend upon the promptness with which human serum is introduced into the circulation. The appearance of purpura in serious or prolonged diseases is a very unfavorable sign.

Treatment.—The treatment of the milder cases is that of the disease with which the purpura is associated. An effort should be made to establish the vitality and resistance of the patient by removal, when possible, of the cause of the condition, and by the administration of acids and fruit-juices. The use of ergot and suprarenal extract has not been of appreciable service. Calcium lactate has appeared to be of some value in cases not severe. Twenty grains should be given every two hours.

Serum Treatment.—As a means of prompt relief, human blood-serum far exceeds in value all other agents. It may be used as indicated in the case referred to. From 2 to 4 ounces should be given daily until the hemorrhage is controlled. (See Hemorrhagic Diseases of the Newly Born, p. 170.)

HODGKIN'S DISEASE (LYMPHADENOMA)

The best description of this disease coming to my observation is to be found in the Johns Hopkins Hospital Reports, vol. x, by Dr. Reed.

Hodgkin's disease is of extreme rarity in children. The onset is very gradual. The first symptoms are usually those of an enlargement of the glands of the neck—usually a one-sided involvement. There is an associated anemia, progressive in type. On account of the enlargement of the glands, there may be pressure, pain, cough, and obstruction to respiration. The glandular enlargement may become extreme. The only changes in the blood are those of marked anemia.

Lesions.—The *lymph-nodes* are enlarged. At first they are soft, gray or grayish red, moist, and show irregular areas of necrosis, which are very characteristic. Microscopically, eosinophiles, giant-cells, and some plasma cells are seen. Later the glands become small and hard, showing, on section, a glistening, white cut surface. This is the stage of cicatrization (Aschoff).

The *spleen* is enlarged, but not so markedly as in leukemia. The cut surface is mottled and irregular, due to red or gray masses (lymphomata) in the follicles.

There may be enlargement of all the adenoid tissue in the body, and lymphomata, smaller than those found in leukemia, may be present in the liver, lungs, kidneys.

Treatment.—All the means used have been ineffectual in true cases.

XI. THE GLANDULAR SYSTEM

DISEASES OF THE LYMPHATIC GLANDS

Lymphatic gland enlargement is of most frequent occurrence in children. It is quite usual, in making a physical examination in children, to find the postcervical and the inguinal glands slightly enlarged. Such enlargement is frequently of no significance.

Pediculi usually cause an enlargement of the gland at the base of the skull.

General Glandular Involvement.—General glandular involvement may mean that the child is generally in a run-down condition or suffering from some local infection, such as an eczema of the scalp or the skin behind the ears. Enlarged inguinal glands may be due to eczema in the folds of the groin or to balanitis.

In lymphatism there may be general glandular enlargement. Thus in a hospital patient the cervical, inguinal, and axillary glands showed moderate general enlargement. In addition there were enlarged, isolated lymphatic glands over the anterior and lateral portions of the thorax. In different forms of anemia there is general glandular involvement. Usually the degree of involvement described is of little consequence. Children who have the tendency to enlargement of lymph-nodes usually fail to show any signs of their presence when adolescence is reached.

An enlargement of the epitrochlear gland is a corroborative sign in syphilis.

The glands at the angle of the jaw are frequently enlarged as a result of infection transferred by diseased tonsils.

ACUTE ADENITIS

Infants and young children possess a ready susceptibility to gland infection.

Etiology.—In cervical adenitis the inflammation results from the draining of an infected source, which may be a decayed tooth, a diseased tonsil, a purulent rhinitis, or any focus from which bacteria may be transferred. In grip, tonsillitis, scarlet fever, diphtheria, measles, and in any throat infection, adenitis may be and frequently is a complication.

Pathology.—The process in the gland may be a simple hyperplastic change, or it may reach the stage of suppuration. The microörganism most commonly associated with suppurative adenitis is the streptococcus, but the staphylococcus, the pneumococcus, the gonococcus, and the typhoid bacillus have been cultivated from diseased lymph-glands in various regions.

Symptoms.—The first symptom noticed will be that of a swelling at the angle of the jaw (Fig. 49), hard, rounded, and quite painful to the touch. Preceding the enlargement there may be a period of fever

for a day or two, during which time the child moves the head awkwardly. Rarely one gland alone will be involved. Usually there are several, although the external examination will make it appear that one, or at the most, two, are enlarged. The tumor may reach a very large size. I have seen the entire space between the jaw and the clavicle filled in and almost replaced by these glands.

The temperature is usually high. In simple adenitis with suppuration I have repeatedly seen it range from 102° to 105° F.

Fig. 49.—Cervical adenitis.

Duration.—The duration varies widely. If there is a streptococcus infection, suppuration may occur in a few days. In scarlet fever this microörganism is usually the infecting agent, a fact which accounts for the many suppurating glands that occur with this disease.

Termination.—The infection always terminates in one of three ways: First, resolution; second, suppuration; third, persistent enlargement (chronic adenitis).

Differential Diagnosis.—Acute adenitis and mumps are very frequently confused. By a comparison of Fig. 49 and Fig. 85 it will be

readily seen that the two conditions have but little in common. In mumps the parotid gland is involved and the swelling is situated close to the ear, with the space posterior to the lobe filled in by that portion of the parotid gland.

Prophylaxis.—A normal, resistant throat is the best safeguard against cervical adenitis. Removal of adenoids and enucleation of the tonsils are better insurance against cervical gland infection than all other means combined.

Axillary and Inguinal Adenitis.—In axillary and inguinal adenitis the infected areas from which the process has its origin must be eradicated. In the inguinal cases balanitis in boys and vulvovaginitis in girls are frequent sources of infection. Axillary adenitis (Fig. 50) is very unusual. When it occurs, the infection has usually been carried from a lesion somewhere in the upper extremity.

Fig. 50.—Axillary adenitis.

Treatment.—After treating many hundreds of cases of adenitis, I have been impressed with the great value of cold applications in the from of a cold-water compress changed every fifteen minutes to half-hour, day and night. Such treatment is arduous, and, of course, in many instances impossible, particularly in dealing with young infants. With older children the dressing may be changed without awakening the patient. For infants the treatment may be continued with good effect from 14 to 16 times a day. The last dressing for the night is to be kept bound on the parts. The use of ointments and local applications other than cold is disappointing. The ice-bag is not so satisfactory as the wet compress.

Suppurative Cases.—Even when the cold compress or ice-bag is applied at the first suggestion of swelling and used faithfully, the cases of streptococcus infection usually go on to suppuration. Repeatedly I have seen the adenitis, which is often an early complication of diphtheria, disappear quickly after full doses of diphtheria antitoxin. When the swelling softens, we know that suppuration has taken place, and our only treatment is to incise freely, allowing the pus to escape, and place

in the wound a strip of sterilized gauze to assist in drainage and to prevent too early closure of the incision. The wound should be dressed once daily. Extirpation of the diseased gland is not to be advised until later, if at all. In fact, a greater part of all the gland tissue may have undergone suppuration, producing complete destruction.

PERSISTENT SIMPLE ADENITIS

After an acute adenitis, in a small percentage of cases, the gland or glands will remain persistently enlarged, so as to constitute a deformity. The deformity may likewise be the result of a series of acute attacks, each leaving the gland a little larger than before. Whether these glands are tuberculous from the outset, or become so later, it is impossible to state. I know, however, from observation of many patients, that some cases which do not show the distinctive characteristics of tuberculous adenitis which we have been taught to expect, do show that they are tuberculous upon examination of the glands which have been removed at operation because of the unsightly deformity. I have, therefore, come to look upon pronounced persistent adenitis as probably of tuberculous origin, even though but two or three glands appear to be involved. Because these chronically enlarged glands sometimes undergo resolution without suppuration does not prove the absence of tubercle bacilli.

Fig. 51.—Cervical adenitis, showing Bier band in position (five and one-half months).

Treatment.—I have treated these cases of persistent adenitis with electricity, drugs, and local medicinal applications, but am unable to advise the use of any one of them, nor have the iodids in my hands been of any appreciable value. The only local means of utility has been the more or less persistent application of cold in the form of a wet compress. The dressing is changed every half-hour—a treatment which is never popular, but which sometimes succeeds. At bedtime the tumor is massaged for fifteen minutes with any non-irritating oil.

The Bier Hyperemia Treatment (Fig. 51).—This method of treatment consists in the application of the Bier neck band (Kny-Scherer, New York) sufficiently tight to produce a slight capillary engorgement of the skin over the face. The band is worn for eleven hours, and kept off

one hour. This method of treatment is of some value in the more acute cases, in which the glandular involvement has resisted cold application and promises to pass into the chronic stage.

Constitutional means, of course, should be employed, iron, cod-liver oil, and the hypophosphites being prescribed if the child's condition appears to require them. In many cases, however, such treatment is not called for, as the children are in perfect condition, the process being entirely local. I have had no experience with the "*x*-ray" and various "light" methods of treatment which are advocated by some writers. My own observation in the management of these cases has been that when the glands remain for several weeks sufficiently large to produce a deformity, removal by surgical means is the only course to pursue. The operation is simple, is quickly performed, and need leave but a very slight scar.

GLANDULAR FEVER

Glandular fever is seen in children usually after the first year. The disease is due to a local infection the nature of which is unknown. The lymph-nodes at the angle of the jaw are involved, forming an elongated tumor between the angle of the jaw and the sternomastoid, which may reach a considerable size. I have seen cases in which the tumors were as large as hens' eggs. Both sides are usually involved; the swelling is first noticed on one side, and is often followed by an enlargement of the glands on the opposite side.

The **symptoms** are fever, usually from 101° to 104° F., prostration, and loss of appetite. The disease is to be differentiated from mumps in that the parotid glands are not involved, and from acute simple adenitis by the absence of throat involvement, and by the fact that nearly all cases recover without suppuration or resulting persistent adenitis. In several of the cases seen during a recent epidemic the rhinopharynx was normal.

The **treatment** consists in the continuous use of ice-bags or the cold compress (p. 262), and laxatives, such as milk of magnesia or citrate of magnesia, sufficient to produce one or two evacuations daily, a reduced diet of broths and gruels, and keeping the patient in bed. The swelling may last from five days to two weeks, and in my cases has subsided without suppuration.

TUBERCULOUS ADENITIS

Tuberculous adenitis is a term applied by common consent to tuberculosis of the cervical lymph-nodes. In cases of early and localized tuberculous involvement, these glands, more often than any other structures, harbor the bacilli. Furthermore, because of the possibility of ready access to the source of the disease, these cases present a better prognosis as regards its eradication than do cases of tuberculosis in any other part of the body.

Age.—The age incidence is interesting. Cases are rarely seen before the third year and do not often develop after the eighth year. I have

known cases, however, to develop much later. My oldest patient was a girl sixteen years of age who was otherwise healthy.

Conditions Favoring the Development of Lymph-node Tuberculosis.—Diseased tonsils and adenoids are the most fruitful cause of tuberculous cervical lymph-glands.

Whether previous inflammatory condition of the glands makes them a more favorable host is not known; neither do we know when the glands become tuberculous. Is the tubercle bacillus the first offender? Holt believes that in most cases the tuberculosis is the primary infection. Heredity probably plays no part in causation. That lymphatism may predispose an individual to the infection is extremely doubtful. It has not been my observation that children predisposed to glandular enlargement from some systemic cause are especially susceptible to bacterial infection. It is my belief that tuberculous glands are dependent for the infection upon the presence of tubercle bacilli in the food and air, and upon a means of communication to the gland which is perfectly supplied by those lymphatics whose function it is to drain bacteria-laden tonsils and adenoids.

Contributory to this belief is the fact that the age from the third to the eighth year is the period during which diseased tonsils and adenoids are of the most frequent occurrence.

Fig. 52.—Cicatrices following a neglected case of tuberculous adenitis in a girl seven years old. There is also a tuberculous patch upon the skin of the cheek in a very frequent location (Holt).

Types of Infection.—In the majority of cases of primary cervical adenitis in children the tubercle bacilli, which have been isolated by observers in this country, England, and Germany, have conformed to the human type. From bronchial and mesenteric lymph-nodes affected with tuberculosis in young children Gofflsey isolated the human type in 55 out of 57 cases. In two the bovine strains were present in the bronchial nodes. Tuberculous glands which have undergone suppuration are usually the seat of a secondary infection with the streptococcus.

Symptoms.—A symptomatology of value in tuberculous adenitis is most difficult, as we do not know positively when a gland becomes in-

fected. Knowledge of very early symptoms is therefore out of the question. Cervical glands are prone to enlargement. One or more may enlarge and disappear or diminish in size, and enlarge again and disappear and never trouble the child thereafter. In another case perhaps the same phenomenon occurs, but the glands do not diminish in size or disappear as formerly, but, on the contrary, remain enlarged. In well-developed adenitis the glands cease to be movable. A periadenitis binds them to the skin and the adjacent tissue and probably to the adjacent glands. The involved glands may be small or large. I have repeatedly seen tuberculous glands as small as a pea undergoing typical cheesy degeneration. Usually one side of the neck is involved. Secondary infection is productive of abscess; the skin over the superficially seated gland becomes acutely reddened and breaks down if not opened, discharging thin, light-yellow pus. Other glands undergo the same process of infection, followed by cheesy degeneration and suppuration, with the formation of a sinus and destruction of skin. Attempts at resolution produce cicatricial changes which add to the unsightliness of the wound. The entire process is a chronic one, and requires years to produce the clinical picture represented in Fig. 52.

Prognosis.—The prognosis is the same as in so many diseases in which the treatment is surgical. The outlook is most satisfactory if the surgeon is given an opportunity to operate early. The girl of sixteen years previously referred to was undergoing treatment for tuberculous nodes by means other than operation. After three months of treatment she developed tuberculous meningitis. This incident occurred very early in my medical career.

Treatment.—My present position is as follows: If the gland may be diagnosed as tuberculous, surgical procedures should be brought into the case. If the diagnosis is not positive, but the gland or glands remain persistently enlarged to a degree sufficient to produce a deformity, the case should be placed in the suspected class and operation should be performed.

The operation is usually attended with most satisfactory results, but should be attempted only by a competent surgeon. I have known results that were not satisfactory. The possibilities of an unsightly scar deter many parents from assenting to an operation. If the operation is performed by the Dowd method, before ulceration of the skin develops, the scar is negligible. Long before adult life is reached it will not be visible.

After the operation the child should, if possible, be given the advantage of an outdoor life in the country, inland. These cases appear to improve most rapidly at an elevation of 800 feet or more. The diet should consist of meat, eggs, milk, and of high-proteid cereals, such as oatmeal and the dried legumes, given in the form of purées. It is my custom to order cod-liver oil and malt to be given in doses of from one teaspoonful to one tablespoonful after meals for one week, followed for one week by the syrup of the hypophosphites. The oil and malt may then be resumed for the same time, thus alternating indefinitely with

the hypophosphites. If an examination of the blood shows that the patient is anemic, iron may be used in connection with the other remedies. The citrate of iron and extractum ferri pomatum are well borne by the stomach, and have appeared to be of considerable service in some of my cases. To children from five to ten years of age one grain of the citrate of iron and quinin in sherry wine, or one grain of citrate of iron and ammonia in water, may be given after meals. The dose of extractum ferri pomatum at this age is one-half grain after each meal.

MASTITIS IN YOUNG GIRLS

Inflammation of the mammary gland in young girls is a comparatively rare condition, but one of sufficiently frequent occurrence to require mention. Swelling and tenderness of the breasts, although often complained of by young girls about the time of puberty, subside without treatment if let alone. My cases of true mastitis have varied in age from seven to twelve years. The condition is usually due to the entrance of bacteria through the nipple, and in its clinical manifestations it resembles mastitis in the adult, except that the entire gland is usually involved, becoming swollen, tender, and excruciatingly painful. There are slight fever,—not above 101° F.,—headache, and lassitude.

Treatment.—Satisfactory treatment during the acute stage has consisted in the use of an ice-bag, which is kept constantly applied during the waking hours. At night a wet dressing of bichlorid of mercury, 1 : 5000, should be kept on the infected glands. A saline laxative in the form of citrate of magnesia should be given at the onset, and a diet of broth, gruel, toast, and stewed fruit is to be continued during the period of fever. Recovery is usual under two weeks. The ice-bag has not been required for more than three or four days. After this period the wet dressing answers the same purpose.

THE THYMUS GLAND

The thymus consists of two lobes, faintly red in color. They are more or less pointed toward the upper part, rounded off toward the lower, and bound together with loose connective tissue. The organ is situated in the anterior mediastinum, and the greater portion of the gland lies behind the manubrium and body of the sternum. Sappey has demonstrated that the thymus in the new-born infant reaches from the upper edge of the manubrium 5 cm. downward, while the upper border at times may reach the isthmus of the thyroid, or be 2 to 3 cm. below it. The sides and lower portion are covered by the folds of the mediastinum, while the anterior borders of the lungs and loose connective tissue separate the gland from the chest-wall. Posteriorly, the gland covers the pericardium in its upper two-thirds and the beginning of the great vessels. Its elongated upper edges cover the trachea. The vagi and phrenic nerves and common carotid arteries bound it on either side, while posteriorly, again in close relation, are the phrenic nerves. The average width is 2 to 3 cm., and at times the longitudinal diameter may reach 11½ cm.

Weight and Size.—As found postmortem, the size and weight of this gland-like organ vary considerably, and, at the present time, there is a wide variation of opinion respecting the normal. Probably the most exhaustive work on this point was done by Bovaird and Nicoll, who weighed the thymus in 495 consecutive autopsies, the results of which were published in 1906. They found the greatest weight at birth, the average being 7.7 gm. Following this there was little change until the period of five years was reached, from which time a gradual reduction took place. Judging from these observations, one may conclude that the average weight at birth is 6 to 7 gm.; from birth to five years, 3 to 4 gm.; and that any weight over 10 gm. may be considered abnormal.

Olivier, in his extensive monograph, gives the following figures:

Birth	4 gm.
1 year	6 "
2 years	8 "
3 "	10 "

He considers all thymi over 15 gm. to be hypertrophied. Sappey, Murkel, and Testut all quote figures higher than Olivier. Friedleben and other observers pointed out, some time ago, that these variations in the weight and size of the thymus may be accounted for by the body nutrition. It appears that the thymus shows the results of excessive loss much more than the body as a whole, for in exhausting diseases the weight of the thymus sinks much more rapidly than that of the body. In exceptional cases the reverse is true. Formerly the thymus was supposed to reach its maximum at birth, and subsequently to atrophy, but more recent observations have shown that remnants persist until puberty, and that true thymus tissue may persist throughout life.

In *status lymphaticus* the thymus often weighs 5 to 10 times more than normal. In well-marked cases its weight may be as high as 55 gm., and in less pronounced cases range between 10 and 20 gm. As a whole, the hypertrophied thymus is a little more vascular than normal, but, aside from hyperplasia, shows no other consistent changes macroscopically or microscopically.

Palpation.—Palpation of the thymus does not give any points by which to estimate its size. The deformity commonly known as "pigeon-breast" is not even remotely associated with an enlarged thymus.

Percussion.—Percussion of the thymus has been carefully studied by Blumenreich and Basch, and is of much greater value than palpation, although neither of these methods has received much support in this country. Many instruments have been devised for percussion, but no two men agree on the results obtained.

Blumenreich found the dulness of the thymus to cover a space somewhat triangular in outline, the base being represented by a line drawn across the top of the manubrium between the two sternoclavicular joints, while the rounded-off point or apex was found to lie about on a line with the second rib. Between this thymus dulness and the normal cardiac dulness on the left is a zone normally filled in by lung tissue; if

this area be dulled, and if all other causes of impairment can be excluded, then a diagnosis of enlarged thymus is justifiable. Among other workers, the names of Basch and Rohn may be mentioned. In their outlining of the thymus they found it to be more rhomboid in contour, but, on the whole, tended to confirm the older work of Blumenreich.

Functions.—*Physiology.*—The physiology of the thymus is indeed very obscure, little being known about its functions. Its closeness to the thyroid and parathyroid glands and its similarity of origin would almost suggest that it played some specific part in metabolism, but physiologic experiments of late have failed to discover exactly what this influence is.

During the past few years there has been considerable experimentation relative to the thymus, which, so far, has apparently cleared up the matter in two directions, namely: the relation of the organ to bone growth and to the condition of the bones, on one hand, and to the electric excitability of the nerves on the other. Basch has shown that following complete extirpation of the thymus in a young dog there occur a softening of the bones and a check to their growth; in fact, a condition very much resembling rickets and chondrodystrophy. At the same time the peripheral nervous system shows an increased electric excitability. Numerous other observers have confirmed these observations, and, in addition, have noted that in thymectomized animals there exists a stage of increased fat absorption and later malnutrition and cachexia.

STATUS LYMPHATICUS

It seems well proved by a long series of cases, carefully studied by competent observers, that the condition known as status lymphaticus is a pathologic entity and is characterized clinically by a lowered vitality or an unstable equilibrium of the vital forces, so that accidents or disturbances otherwise unimportant, such as some slight injury or anesthesia, may precipitate failure of the heart and respiration.

The explanation of the deaths occurring in these infants—most frequently during the first eighteen months—is very difficult, and in many cases a careful autopsy does not clear up the situation. Many extraordinary hypotheses have been advanced. Some believe that pressure exerted by the hyperplastic thymus on the vital organs in this region is sufficient to account for the many deaths; others are convinced that the pressure exerted by this gland is sufficient to produce a tracheal stenosis, although such a belief seems far-fetched when one considers the weight of thymus and contrasts it with the fibrous tracheal rings. Still, on the other hand, cases have been reported which were undoubtedly afforded relief by operation anchoring the thymus to the under surface of the sternum.

The occurrence of a sudden swelling has not yet been proved and not even the theory of a narrowed thoracic outlet, which might still more be narrowed by a forceful extension of the head, has received much support. It does not seem possible that such a powerful vessel as the aorta, which is capable of eroding bones, could be pressed upon with

fatal results, as is supposed by some authors. There exists a probability that in many of these cases of infants dying suddenly a careful subjective history and a closer objective observation would have revealed an acute capillary bronchitis.

According to Paltauf's many extensive observations, the cause, apparently impossible to explain, lies in a peculiar constitutional anomaly, which makes its possessor weak and less able to stand attacks of illness, death being easily produced from trifling causes.

Autopsy findings in these subjects usually show a general lymphatic enlargement of tonsils and follicles at the base of the tongue and intestine, and swelling and enlargement of the thymus, especially at an age when it has generally disappeared.

XII. THE UROGENITAL SYSTEM

The Urine

Tables dealing with the frequency of urination and the specific gravity of the urine for the different ages of childhood are necessarily inaccurate, particularly when they refer to children under one year of age.

Urinary Observations.—At the New York Infant Asylum a few years ago Dr. George T. Myers, at that time resident physician, made a series of investigations under my direction relating to the various phases and functions of the newly born infant, which differed from some of the observations previously recorded. The series comprised 45 cases. Among other observations was one as to the time of the first micturition after birth. It was found that the time varied greatly. In fifteen micturition occurred simultaneously with birth; in ten, in less than four hours; in eight, in from four to eight hours; and in the remainder, ranged between eight and eighteen hours after birth. In but two cases was the interval longer than fourteen hours. It was also found that the specific gravity, the frequency of urination, and the amount of urine passed were subject to wide variations within normal limits. These various features depended upon whether the infant was breast-fed or bottle-fed, whether a girl or a boy, and whether, if the baby was breast-fed, the mother had a scanty or a free flow of milk. The bottle-fed always passed more urine than the breast-fed. The quantity of urine is also influenced by the clothing worn and by the season of the year.

Normal Variations.—Normal variations occur, therefore, within very wide limits. One child will pass urine every thirty minutes when awake; others, of equal health and age, will retain it for three hours. Before the child takes much fluid, particularly in the first days of life, from two to five ounces is probably passed in twenty-four hours, with a specific gravity of 1.005 to 1.010. Infants urinating very frequently are apt to develop into bed-wetters in later life, probably owing to the undeveloped condition of the bladder, the size of that viscus remaining small. In other respects, very frequent urination, in the absence of signs of illness, is of no significance in the young. After the feeding is established, the specific gravity will range from 1.003 to 1.012 from the second week to the second year. A baby nine months old will pass an average of about twelve ounces of urine in twenty-four hours. At the sixth year, from sixteen to twenty-five ounces with a specific gravity under 1.015 will be passed. From this age until puberty both the quantity and specific gravity gradually increase, the usual range in specific gravity being from 1.010 to 1.020.

Method of Collecting Urine.—The collection of the amount voided in twenty-four hours by children of the "runabout" age is difficult, and in young infants well-nigh impossible, except in a metabolism bed. For accurate work the specimen should be obtained by the catheter. When for any reason this is not possible, there are various devices for collecting the urine, any one of which may be tried. The tying on of a wide-mouthed bottle or a condom in boys, fastening it with adhesive strips to the body, is often successful. Absorbent cotton into which the child urinates, the urine being expressed from this into a bottle, may be used for either boys or girls, as may also the Chapin collector. The chief disadvantage of any of these measures is the certainty of contamination. The urine so collected may answer for an examination for albumin, sugar, or the renal elements, but is useless for a bacteriologic study.

Continence Established.—From the second to the third year continence at night is usually established. If incontinence continues after the third year, the case should be looked upon as abnormal and receive treatment accordingly. (See Incontinence of Urine, p. 419.)

DIFFICULT AND PAINFUL URINATION

Painful urination is of frequent occurrence in infants and "runabout" children. It may be due to irritation at the urethral outlet following injury, or to scalding from acid urine. Not infrequently the irritation is due to lack of cleanliness of the parts. In boys with long foreskins which remain moistened the urine undergoes decomposition, and inflammation about the orifice of the urethra is the result. In girls dysuria is often due to a hardly discernible inflammation about the orifice of the urethra, occurring in association with vulvitis or vulvovaginitis.

In two cases I have found calculi in the urethra. Both patients were boys about five years of age. By far the greater number of patients who suffer from difficult micturition are boys who have phimosis with adhesions and retained smegma. Attention to the external genitals in the matter of cleanliness, the operation of circumcision, or the relief of adhesions by slitting the foreskin and freeing the glans promptly relieves the condition. Among the operative procedures, only circumcision should be employed. As a temporary measure, the dorsal slit may suffice.

RETENTION AND SUPPRESSION OF URINE

In using the above terms with reference to diseases of the urinary organs it is well to appreciate their significance. By *suppression* is meant a condition of anuria in which no urine is passed into the bladder, that viscus being found empty on catheterization. In *retention* the urine is secreted by the kidneys and passed into the bladder, but is not voided. When the urine is not voided, we must always ascertain whether there is suppression or retention. If there is retention, this fact may usually be discovered by palpation and percussion. In fat chil-

dren a positive diagnosis may be impossible by this means. In the event of doubt, a catheter should be employed. For infants under one year of age a soft-rubber catheter, No. 4 or 5 American, should be used. The bladder of the infant and young child is very readily infected and care should be exercised to have the catheter sterile. If suppression is diagnosed and treatment by diuretics is instituted, when actually there is simple retention, no little trouble will result, as I have occasionally seen.

Suppression of the urine may persist for hours without any grave pathologic condition of the kidneys. Chilling of the skin surface may be a cause. In acute gastro-intestinal disorders with frequent vomiting and watery stools suppression may exist for twenty-four hours. The secretion is reëstablished when there is again an available fluid to be added to the circulation from the digestive tract. If the suppression is due to causes of a grave nature, such as acute nephritis, there will usually be signs of other trouble, such as vomiting, fever, and edema.

Retention may result from an injury to the urethra, or from vaginitis, or from phimosis. Impacted stone in the urethra was a cause in two boys seen by me. Fortunately in each case the stone was located near the meatus and readily removed.

Treatment.—*Retention.*—The immediate relief of retention is by catheterization. Further treatment consists in the correction of the exciting cause. If a catheter is not at hand, the application of a hot stupe over the lower portion of the abdomen and the genitals may be sufficient to stimulate urination.

Suppression.—Colon flushing is one of the most effective measures of relieving suppression of the urine. The apparatus required and the methods employed will be found on page 763. If the temperature of the patient is not above 102° F., normal salt solution, at a temperature of 110° F., is advised. I have always found flushing more effective when this degree of heat was used. One pint is introduced for a child three years of age. In children of one year or under, from 4 to 8 ounces is all that will be retained. The enema must not be repeated, however, oftener than once in six or eight hours, as the colon of a child soon becomes intolerant of the injections and but little will be retained. Repeatedly, after the first injection, the kidneys have resumed activity when all other means had failed. This method has been particularly useful in cases following or accompanying the exanthemata, when there was an acute nephritis with greatly diminished secretion of urine.

INCONTINENCE OF URINE (ENURESIS)

In enuresis there is an involuntary emptying of the bladder.

Enuresis diurna is the involuntary emptying of the bladder during the waking hours.

Enuresis nocturna is the involuntary emptying of the bladder during sleep.

Involuntary discharge of the urine is normal in the young infant. Urination becomes a voluntary function at an age depending largely

upon the child's training. In most children, with the right kind of management, the function may be controlled during waking hours by the tenth month.

During sleep, involuntary urination continues to a later period, and, while in many perfect control may be established at the completion of the second year, I do not regard the lack of control as abnormal until the third year is completed. If, during the second year, the child shows a tendency to frequent urination and involuntary passage of urine during the waking hours, with habitual incontinence at night, it is my custom to advise preventive measures.

When the incontinence persists during the waking hours at the completion of the second year, or during sleep at the completion of the third year, the condition is regarded as abnormal and the child is placed under treatment.

Etiology.—*Deformities and Abnormalities.*—The condition may be due to a congenitally small bladder, with very little holding capacity. A girl who came under my care for treatment for incontinence by day and night had a bladder the holding capacity of which was but one ounce. With such lack of development of the bladder, obviously there must be incontinence. In spina bifida it may occur as a result of paralysis of the pudic nerve supply to the neck of the bladder; a congenitally large urethra may also be a cause.

Peripheral causes acting through reflex irritation are not infrequently encountered.

Thus, incontinence may be due to a vaginitis, to an adherent clitoris, or to phimosis. It may be due to thread-worms in the rectum, to constipation, to stone in the bladder, to cystitis, or to hyperacidity of the urine.

The diet may also play a part. The use of highly nitrogenous food in large amounts or a diet rich in sugar may lead to changes in the urine sufficient to cause the trouble.

Excessive bed-clothing and the habit of sleeping on the back have a bearing in the causation.

Adenoid vegetations in considerable amount in the nasopharyngeal vault are looked upon by some authors as an etiologic factor. Those afflicted with diabetes insipidus (polyuria) or diabetes mellitus, because of the large amount of urine passed, are very apt to suffer from incontinence.

Weakness of the sphincter is supposed to play a part in causing incontinence, particularly loss of control when awake.

Cases of Nervous Origin.—The nervous control of the bladder is dependent upon a cerebral center and a sacral center, each receiving and sending out impulses.

It is not difficult to understand how a lack of coördination from faulty development of the sympathetic mechanism might occasion incontinence. After all possible dietetic errors and irritations acting reflexly through the above nerve mechanism are excluded, about 90 per cent. of our cases remain unexplained. This group represents the

cases usually chronicled as due to a neurosis, absence of coördination due to failure of sufficient development of the nerve-centers.

Diagnosis.—The patient always has a ready-made diagnosis.

Prognosis.—The prognosis depends largely upon the physician and the child's parents or attendant. Great patience and persistence are necessary. All cases are curable except when an anatomic abnormality exists. In many instances the response to treatment is very prompt. In others it is tedious, several months being required before we are sure that the cure is complete.

A fact to be taken into consideration in making a prognosis as to the probable duration of the treatment in a given case is the size of the bladder, since a child who has suffered from incontinence both by day and night may have a small and contracted bladder, because of lack of development from disuse. The most reliable means of determining the size of a bladder is by measuring the amount of sterile water which can be introduced through a catheter.

Treatment.—In assuming the care of a child with enuresis, obviously it is most necessary to learn the cause of the trouble. Two or three examinations of the urine should be made, and if this is found persistently acid and of a specific gravity over 1020, a reduction in the nitrogenous food-stuffs is necessary before beginning medication. If the enuresis is due to peripheral causes, they must be corrected and the general physical condition of the child improved, although in my experience the delicate and chronically ailing are not the children who are the greatest sufferers, by far the larger number of my patients having been well-nourished children who were otherwise normal. Long-continued incontinence does not appear to affect the general health. When well established, the condition, untreated, usually continues until the child is eight or ten years of age. I have known of a few cases which persisted until puberty, or later.

If no improvement follows the removal of all possible dietetic and peripheral causes,—acidity, phimosis, worms, constipation, etc.,—we must assume that we have an idiopathic incontinence to deal with. If the case is one of nightly incontinence of several months' or years' standing, we must positively acquaint the mother with the fact that prolonged treatment will in all probability be required, and that unless her active and continued coöperation is assured the treatment of the case will not be undertaken.

With the very definite understanding that no brilliant results are immediately expected, the following scheme of management is inaugurated: The child receives three meals daily. The breakfast and dinner correspond to the age of the child, but with the important exception that red meat is to be given but once during the twenty-four hours, and only at midday. The supper, which should not be later than 6 o'clock, I designate as a "dry supper." It may consist of any cereal, such as rice, hominy, farina, or wheatena, served with butter and sugar. If this is not well taken, a small quantity of both sugar and milk may be added. Permissible articles for the evening meal in addition to the

above are: ice-cream, milk toast, blanc-mange, raw fruit, jelly, stewed fruit, bread and butter, junket, and corn-starch. Meat, eggs, or heavy foods of any kind should not be given at night.

Abstinence from Fluids.—At 4 o'clock in the afternoon the child may be given a half-glass of water or milk, but after this time no fluids are to be allowed other than a scant ounce of milk on the cereal. The withdrawal of all fluids after 4 P. M. will at first be a hardship for some children, and they may be allowed three or four ounces of milk or water with the evening meal; but this quantity should gradually be diminished until at the end of a week it will not be missed.

Night Management.—The patient should be as lightly covered at night as comfort will permit. There is less tendency to incontinence if the child rests on the side or stomach, and sleep in this position should be encouraged. In dealing with inveterates, for whom every possible aid is brought into use, I have used the knotted towel as a means of keeping the child off his back. The towel, knotted in the middle, is passed around the child so that the knot will rest on the back. The ends of the towel should then be pinned together over the abdomen like those of an abdominal binder. When the patient attempts to rest on the back the knot causes discomfort and the position is changed. At 10 or 11 o'clock, when the person in charge retires, the child should be taken up to urinate.

Drugs.—Without a strict observation of the above measures, particularly those referring to diet and abstinence from water after 4 P. M., drugs are of no value, whatever their method of administration. With the above suggestions carried out, we have one remedy which is of great value, and that is belladonna. For convenience of administration I prefer the alkaloid, atropin. To insure full benefit in severe cases the drug must be pushed until we obtain the physiologic effect, as shown by slight dilatation of the pupils. Before beginning the treatment it is well to advise mothers that redness of the skin need cause no alarm, but calls for the discontinuance of the drug until further instructions are given. The atropin is administered in a solution of one grain to an ounce of water; one ounce of water contains approximately 500 drops, so that one drop of the atropin solution will contain approximately $\frac{1}{500}$ grain of the drug. The mother is given a chart containing the directions for administration, which for a child five years of age are as follows:

1st day	4 P. M. 0 drop	7 P. M. 1 drop
2d "	" 1 "	" 1 "
3d "	" 1 "	" 2 drops
4th "	" 2 drops	" 2 "
5th "	" 2 "	" 3 "
6th "	" 3 "	" 3 "
7th "	" 3 "	" 4 "
8th "	" 4 "	" 4 "
9th "	" 4 "	" 5 "
10th "	" 5 "	" 5 "

The maximum dose given is one drop daily at 4 and 7 P. M. for every year of age. Thus, for a child three years old the dosage should not

be greater than three drops, twice daily; for a child six years old not over six drops, twice daily. It may be well, if the case is not under close observation, to make a more gradual increase than the above, in the dosage, so as to avoid the possibility of unpleasant physiologic effects.

It is never necessary to exceed these doses even with older children, for the reason that the amounts given are sufficient to control the enuresis; and the dilated pupils and belladonna blush which follow an increased dosage show that such increases are imprudent.

The tolerance of atropin varies considerably, although children usually bear it very well. Now and then a child is treated who cannot take more than two drops ($\frac{1}{250}$ grain) daily. To one boy eight years of age but $\frac{1}{200}$ grain could be given twice daily.

Pronounced benefit, ordinarily, will not be observed during the first week or two of treatment. If the child suffers from incontinence while awake, this will first be cured. The improvement in nocturnal incontinence is more gradual and may be considerably delayed. Thus, no improvement whatever may be seen for two or three weeks. In the average case the improvement is gradual. At first there will be nights at short intervals when there will be very slight incontinence, or none at all. Usually, after a few weeks' treatment the incontinence entirely ceases.

The mistake frequently made is to stop the atropin at this point. When this is done, there is usually an immediate return of the trouble. The full treatment should be continued until the child has not wet the bed for at least two weeks. The daily amount of atropin should then be reduced one-half and kept at this point for six weeks. If at the end of two months from beginning treatment there is no incontinence, the drug may be discontinued, but the dietetic restrictions, particularly the "dry supper," should be maintained three months longer. It must be remembered that the habit which has become established is hard to overcome, even after the neurosis and the weakness of the sphincter have been corrected.

Strychnin and tincture of cantharides have been advocated by pediatric writers. For weak, poorly nourished children strychnin added to the iron or oil may be of service in improving the general condition of the patient, and indirectly aid in the treatment of the enuresis.

When incontinence occurs only during the day, the dietetic regulations are the same, with the exception that the fluids allowed need not be curtailed unless the quantity is excessive. The dosage of atropin is the same, but the time of administration should be changed to after breakfast and after luncheon, instead of at 4 and 7 P. M. In addition to the atropin, strychnin should always be given in cases of incontinence by day, for in such cases a lack of development or a relaxation of the sphincter is more of a factor than is failure of nerve coördination.

HEMATURIA (BLOOD IN THE URINE)

The presence of blood in the urine may be due to readily discernible causes; or when small (microscopic) amounts are present, the cause may be most difficult to determine.

Highly concentrated urine may be sufficiently irritating to produce the passage of microscopic amounts of blood. Blood and albumin are not of infrequent occurrence in the urine of the newly born and during the first weeks of life, because of the presence of uric acid in large amounts peculiar to this period of life.

Among the possible causes of blood in the urine are:

Acute nephritis.
Scarlatina.
Hemophilia.
Purpura hæmorrhagica.
Scurvy.
Trauma.
Calculi.
Malignant growth of the kidney.
Tuberculosis of the kidney or bladder.
Certain drugs taken into the stomach.

HEMOGLOBINURIA

In this condition the urine contains the coloring-matter of the blood, with few, if any, corpuscles. There may be a small amount of albumin. The urine may be light red, brown, or even black. In a child one year old who died from creasote poisoning the urine was almost black. This case was seen in consultation. In another case of a child three years of age with malaria the urine was of a deep brown color.

Paroxysmal hemoglobinuria is of very rare occurrence in this country. In tropical countries, where severe forms of malaria are common, the condition is not unusual. It is due to some toxic agent or ferment which dissolves the coloring-matter out of the blood.

PYURIA

Pus in the urine in the young is usually the result of a cystitis, cystopyelitis, or pyonephrosis.

Illustrative Case.—A hospital patient, about eighteen months of age, showed periodically large amounts of pus in the urine. Pus would be present in the urine for a few hours, and then, for two, three, or more days, the urine would be perfectly clear and free from pus.

Autopsy showed that although one kidney was normal, the other had undergone cystic degeneration, the pelvis being greatly dilated and filled with pus, The ureter was thickened and partially occluded. When the sac had become filled with pus, and the child was in a favorable position, the pus probably discharged into the bladder.

Pyelonephritis may be the result of a pyelocystitis.

Illustrative Case.—A child eleven months of age had pyelitis, evidently primarily, which had not been recognized. The temperature ranged very high,—105° to 107° F.,—and the child died from exhaustion and anemia. Autopsy revealed an extensive pyelitis with multiple abscesses scattered throughout the kidney structure, varying in size from a pin-point to a pea.

Such cases as the foregoing, it is understood, are of very unusual occurrence. In still rarer instances the pus may be due to an abscess, phrenic or of other type which may open into the urinary tract. When pus is present in the urine, the source is usually the bladder (cystitis) or the pelvis of the kidney (pyelitis).

Specific urethritis (gonorrhea) will give rise to pus in the urine. Gonorrhea, however, is of very unusual occurrence in boys, and when present, it is sufficiently active to leave no doubt as to the nature of the trouble.

GLYCOSURIA

Temporary glycosuria or dietetic glycosuria is of frequent occurrence and little significance. This condition usually means that more sugar is being taken than can be cared for by the economy, and with a discontinuance of the excessive intake the sugar disappears from the urine.

Illustrative Cases.—In a series of observations made several years ago at the Country Branch of the New York Infant Asylum, 10 children were selected for high-sugar feeding, and 10 per cent. sugar mixtures were given to those under one year of age. Every case showed glycosuria after twenty-four hours of this feeding.

Two most interesting cases of persistent glycosuria without any other manifestation of illness have been under my observation for the past fifteen years. That sugar existed in the urine of both patients was discovered by accident. How long the sugar may have been present, we have no means of knowing. The mother, an unusually careful woman, conceived the idea that it would be wise to have the urine of all her four children examined. It was accordingly sent to me, and greatly to my surprise I found that two specimens, one from a boy of four years, the other from his brother of six, contained a large amount of sugar—3 and 3.5 per cent. respectively. A careful examination was at once made of both patients, but revealed nothing abnormal. The children were strong; there were no unusual thirst and no polyuria, and, further, the examination of the urine failed to reveal the presence of either acetone or diacetic acid. They were placed on a rigid antidiabetic diet (p. 713), which reduced the sugar to 1.5 and 2 per cent. respectively. During the fifteen years that have since intervened the boys have made satisfactory physical and mental progress; they have attended school regularly, except when prevented by the usual ailments of childhood. Both have undergone operation for adenoids and enlarged tonsils, under ether anesthesia, with no more than the usual discomfort. They have made normal increase in stature, weight, and strength, and are perfectly normal in appearance. During these years monthly examinations have been made of the urine. There has never been less than 1.5 per cent. of sugar in any specimen. The sugar has rarely been below 3 per cent. or above 6 per cent. The condition has persisted in spite of the most careful diet. There never has been polyuria or extreme thirst. The children have been seen by several consultants in New York city, and have been under the treatment of three well-known specialists in Germany. Recently acetone has been found in the urine of one. Probably every variety of treatment which might be expected to exert an influence on the sugar-production has been tried for protracted periods without exerting a particle of influence in reducing it. Indiscretions in diet increase the sugar; otherwise it varies as stated above. None of the physicians here or abroad who have treated the boys has seen similar cases.

The cases here cited in detail are of much interest as showing the inefficiency of medication and the effects of diet in glycosuria, and, furthermore, as presenting a clinical picture which is most unusual. It has

been suggested that the glycosuria in these cases may be due to some persistent and unusual toxemia from intestinal sources.

The Kidneys

TUBERCULOSIS OF THE KIDNEY

Tuberculosis of the kidney is usually secondary to tuberculosis existing elsewhere in the body. Primary cases, however, have been reported.

Lesions.—In general tuberculosis miliary tubercles are scattered throughout the kidney. In other forms there are nodular lesions, or foci of caseation which may break down, resulting in the formation of cavities.

Symptoms.—The symptoms of the disease are progressive weakness and emaciation, attended by a low grade of fever. In many instances the affected kidney is enlarged and palpable. Frequency of urination is a characteristic symptom, and the urine may contain albumin, blood, or pus. The presence of blood for a considerable period in urine of normal specific gravity containing no casts is strongly suggestive of tuberculosis of the kidney. The finding of the tubercle bacillus in the centrifuged urine substantiates the diagnosis. Catheterization of the ureter is of value in demonstrating whether one or both kidneys are involved.

Prognosis.—The prognosis is unfavorable.

Treatment.—Tuberculin therapy, in careful hands, may be of value. In all cases the routine supportive treatment followed in other forms of tuberculosis should be employed. When one kidney remains normal, the best results are gained by surgery involving extirpation of the diseased organ.

NEW-GROWTHS OF THE KIDNEY

Non-malignant.—Non-malignant new-growths of the kidney are uncommon. *Adenomata* and *fibromata* are occasionally encountered. The adenomata are either papillary or cystic, and are encapsulated by connective tissue. These growths appear as small, light-colored nodules, and, microscopically, present an alveolar or tubular structure. Fibromata exist as white, nodular masses, usually not over ¼ inch in diameter. They are imperfectly differentiated from the interstitial connective tissue of the kidney.

Malignant.—*Adenosarcomata* and *adenocarcinomata* are two forms described in the literature. Herringham* emphasizes the fact that the degree of malignancy of such growths cannot be accurately determined from their histologic structure.

Malignant neoplasms of the kidney are more common before the fifth year of life than in any succeeding decade.† These tumors have

* Kidney Diseases, 1912, p. 309.

† Herringham on Statistics of Morris, Kidney Diseases, p. 311.

been classified as carcinomata and sarcomata. Most of the growths, however, are atypical mixed tumors of embryonic origin, and may contain striped muscle, cartilage, and lipomatous or fibrous connective tissue. To such forms the term *rhabdomyosarcoma* has been applied.

The *hypernephroma* is derived from suprarenal tissue, which may be included in the developing kidney. This tumor is subject to great variations in size and structure, and may resemble sarcoma, adenoma, carcinoma, or perithelioma. The growth characteristically contains pigment, which is identical with that found in the adrenal. Not infrequently the hypernephroma becomes cystic.

Symptoms of Renal Neoplasms.—Malignant growths of the kidney often attain an enormous size, half filling the abdominal cavity and displacing certain of the contained organs. The abnormal mass is usually movable and occasionally communicates pulsations from the subjacent aorta. The edges of the tumor are more rounded than those of an enlarged spleen or liver, and the anterior surface is less closely related to the ribs. Apart from the local physical signs, the patient may present no significant symptoms. Nutrition, however, is generally impaired, and in many instances the tumor occasions dragging pain and hematuria.

Prognosis.—In untreated cases the course of the disease is progressive and its outcome fatal. Metastases, however, are of relatively slow development, and are preceded by involvement of the veins closely related to the growth.

Treatment.—Nephrectomy is the only treatment of value, and even this is useless when multiple metastases have occurred.

The majority of the cases which undergo operation develop malignancy in the remaining kidney within a year or so after the operation. A very exceptional case was that of a two-year-old girl, a patient at the Babies' Hospital in New York city. From this child Dr. Robert Abbe removed a large kidney sarcoma. The recovery was complete, and the patient is now a perfectly well young woman, twenty-five years of age.

HYDRONEPHROSIS AND PYONEPHROSIS

Hydronephrosis is a condition characterized by distention of the pelvis of the kidney with an accumulation of urine. With an invasion of the contained urine by the colon bacillus or other pathogenic organisms, a *pyonephrosis* develops.

Etiology.—A few cases of traumatic hydronephrosis have been reported. Ordinarily, however, the disease develops as the result of some obstruction in the urinary tract which may be either congenital or acquired.

Congenital hydronephrosis may be due to an angular junction of the ureter with the pelvis of the kidney, septa or valves in the ureter, an abnormally small ureterovesical orifice, twisting of the ureter by a floating kidney, or an imperforate urethra.

Acquired hydronephrosis may be occasioned by inflammatory

stricture of the ureter, an obstructing calculus, or external pressure on the ureter by a neighboring tumor.

Pathology.—The ureter is dilated and perhaps sacculated above the site of the obstruction. The kidney is usually, but not invariably, enlarged, and on section the organ will be found to be structurally deficient and more or less cirrhotic. The contained fluid resembles normal urine, but contains a relatively small amount of urea. In long-standing cases the kidney may become infected and undergo suppurative inflammation. In such instances the fluid contents become purulent and the condition resolves itself into pyonephrosis. In fact, in all my cases which came to autopsy—3 in number—a pyonephrosis was present. Usually one kidney only is involved. In two of my cases both organs were effected, the pelvis being so dilated as to be almost unrecognizable. In a newly born babe who died in five days both kidneys were enlarged, soft, and easily palpable.

Chronic diffuse nephritis is frequently associated with hydronephrosis.

Symptoms.—The significant manifestations of "dropsy of the kidney" are localized pain and tenderness, a fluid tumor in the kidney region, and scanty urination, which may be interrupted at intervals by the discharge of urine of low gravity in more than normal amount. In doubtful cases aspiration of the fluid from the tumor may facilitate the diagnosis. Pus is usually present in the urine, and through cultures the nature of the infection may be learned.

Prognosis.—Children suffering from bilateral hydronephrosis die in early infancy. When the condition is unilateral, the patient may survive, provided the unaffected kidney is in other respects normal.

Treatment.—Prophylactic doses of urotropin have been administered to forestall possible suppuration. Surgery, however, offers the best possibilities, and the only operation of permanent value is nephrectomy.

Illustrative Case.—A recent case presented very puzzling symptoms. There was a periodic discharge of large amounts of urine, containing free pus, casts, and epithelial cells. The phenomenon occurred about every second or third day. Between times specimens of the urine obtained by catheter were normal. The child died from malnutrition and marasmus. At autopsy one kidney was found normal. The other showed a typical dilated hydropyonephrosis, with the upper two-thirds of the ureter dilated, sacculated, and thickened. In the lower portion there was a congenital constriction with angulation which gave way when the pressure from above became pronounced and the kidney contents were evacuated.

CYSTS OF THE KIDNEY

Cysts of the kidney are usually congenital, due to defective embryonic development. These cysts occur in that portion of the organ which is developed from the metanephros. They are almost always bilateral, and are usually associated with a process of fibrosis which replaces a variable amount of the parenchyma of the affected organ. In many of the patients other congenital malformations coexist.

Retention cysts occasionally arise from obstruction along the courses of the uriniferous tubules, and secondary cystic degeneration may be

induced in a kidney which is the seat of a destructive primary disease. Hydatid cysts develop occasionally as the result of echinococcus invasion.

Many infants with congenital cysts of the kidney die in the first year of life.

Symptoms of the diseased condition are unapparent, or else are confined to the local signs of tumor, and such manifestations of urinary retention as edema and uremic convulsions. Wyeth states that it is a safe rule to aspirate the contents of a renal tumor which is large enough to be appreciated by palpation and inspection. If this be done, the fluid from congenital cysts will be found to resemble that from a hydronephrosis, that from a hydatid cyst will show the presence of hooklets, and that from an organ undergoing cystic degeneration will be found to be highly albuminous.

When **treatment** of cyst of the kidney is justifiable, the procedure must be surgical.

ACUTE PARENCHYMATOUS NEPHRITIS (ACUTE DIFFUSE NEPHRITIS)

Nephritis, in common with many other ailments of children, may be either mild or severe. It may be so severe as to cause death in a few hours, or so mild as to pass unrecognized. In cases often classed as primary, nephritis probably is the sequel of unrecognized scarlet fever. I have seen but three apparently primary cases in young infants three and four months of age, in whom no previous disease had existed. All were institution children, and all the cases came to autopsy.

Etiology.—In an immense majority of cases acute nephritis occurs as a complication of the acute infectious diseases. Nephritis is more frequently associated with scarlet fever than with any other ailment of childhood. I have observed acute nephritis complicating scarlet fever, diphtheria, parotiditis, measles, malaria, influenza, varicella, general sepsis, and acute intestinal infection.

Effects of Different Toxic Agents.—Acute inflammation of the kidneys is caused by chemical or bacterial irritants. In the course of any local or general infection, toxins or bacteria, or both, are excreted by the kidneys, and may cause degeneration or inflammation of these organs. Thus pneumococci may be isolated from the urine in the course of a nephritis complicating pneumonia, typhoid bacilli during typhoid fever, and streptococci during any streptococcal infection. The bacteria are also found in the kidney at autopsy. The diphtheria toxin, and not the bacillus itself, is the cause of post-diphtheric nephritis.

Suppurative inflammation of the kidney may be of hematogenous origin, due to any one form of the pyogenic cocci, or it may be caused by an ascending inflammation from the bladder, ureter, and pelvis of the kidney. The latter condition is a pyelonephritis, and its almost invariable cause is B. coli communis.

Pathology.—The changes which occur in the kidney may be predominantly exudative or productive in character, and may affect the parenchyma most severely, or be fairly well limited to the interstitial tissue.

In ordinary acute nephritis of the *parenchymatous type* the organ is enlarged, of decreased consistence, and on section presents a dull gray cortex the capsule of which strips easily. There is a more deeply congested medulla. Structural markings are obscured, although occasionally the glomeruli stand out on the cut surface as scattered reddish spots. Microscopically, the parenchyma is found to be the seat of granular degeneration and exfoliation, so that the tubules have become dilated with necrotic cell-products, casts, and free blood-corpuscles, the amount of blood depending on the degree of congestion in the vessels of the glomeruli. The kidney stroma is edematous and may show considerable cellular infiltration and proliferation. Proliferation of the cells lining the capsule of Bowman is also common.

Shennan states that the degenerative changes in the kidney depend on the nature of the causative toxin and its concentration, some toxins producing chiefly catarrhal changes, while others cause cell necrosis. The urine under the conditions described, although decreased in amount and containing albumin and casts, may, nevertheless, be of low specific gravity, due to diminished excretion of urea.

In acute nephritis of the *interstitial type*, which is much less frequent, the urine may be free from pus, casts, and albumin. More often, however, this condition does not obtain, as the nephritis is secondary to a general pyemia or part of an ascending pyelonephritis, in which case the tubules microscopically show evidences of marked degeneration in addition to the more apparent process, an infiltration of the connective tissue with polynuclear cells.

In a late nephritis of the interstitial type the development of fibrous tissue with atrophic changes in the glomeruli may possibly render the diseased organ smaller and firmer instead of larger and softer than normal.

In the typical diseased *kidney of scarlet fever* there is a very characteristic glomerular nephritis, marked by a proliferation of the epithelial and endothelial cells lining the capsules and on the tufts, and by an extensive round-cell infiltration of the tissue about the glomeruli. A severe attack of renal congestion during the febrile period of scarlet fever does not ordinarily become chronic; but a glomerulonephritis, slow in onset and of the productive type, may cause death from acute suppression of urine during convalescence, or perhaps terminate in chronic nephritis.

Time of Development.—Nephritis may develop at any time during the active stage of scarlet fever. It is rare before the third week, and it may be delayed for several weeks after. Cases not infrequently develop after the sixth week. I have known the nephritis to appear as late as three months after the acute symptoms of the primary disease have subsided. The severity of scarlet fever bears but little relation to the development of nephritis or the time of such development. In consultation practice a previously undiagnosed illness, with rash or stomach disturbance, has been determined as having been scarlet fever by the development of nephritis at a considerably later date.

Symptoms.—The disease may exist, run a mild course, and terminate

favorably without symptoms. That this occurs in many instances is beyond doubt.

Usually the first symptom noticed is a slight puffiness (not edema) about the eyes. A similar puffiness of the fingers and the ankles occurs, and the backs of the hands, as well as the ankles, soon become edematous. The skin becomes pale and of peculiar waxy whiteness. The patient exhibits loss of appetite and nausea, and sometimes vomits. Mild frontal headache is a frequent symptom. As the case progresses the peculiar pallor increases, the face becomes very much swollen, the eyes almost closed, and the legs and the feet increase very much in size and have a cushion-like appearance and consistence. The subcutaneous tissue over the back and abdomen becomes infiltrated, and the whole aspect of the body is changed. There is a smoothing out of the folds and angles, giving a decidedly rotund appearance. As the result of such a general edema the child increases very much in weight. A child weighing 40 pounds will increase in weight one-third. I have seen an increase of 15 to 20 pounds in not a few cases.

In children one would invariably look for the more active symptoms, headache, vomiting, and prostration, but in many instances these symptoms are not prominent.

Fever.—An elevation of temperature usually exists in all cases, but it is not necessarily high. Although a fever of 103° to 105° F. is of occasional occurrence, the usual temperature range is from 100° to 103° F. The temperature, as a rule, is not of long duration unless the case is to have a fatal termination. I look upon a high continuous temperature as an unfavorable sign.

The Urine.—In every case of scarlet fever—in fact, in all infectious diseases—the urine should be examined daily, as recommended under the subject of management. Time and again I have known cases showing a moderate amount of albumin and casts, with a few blood-cells, to clear up entirely under treatment. If these cases are not recognized and properly treated, a large proportion go on to develop the more serious characteristic signs of the disease.

The first objective sign will be scantiness of the excretion of urine. The urine voided will be reduced from a total daily quantity of 30 to 40 ounces to only 10 or 15 ounces. Later a very few ounces only may be excreted, or the urine may be completely suppressed (anuria).

The color becomes very dark, and if blood is present, the urine will show a decidedly smoky appearance. Blood may be present in such large amounts as to give the appearance of pure blood.

Uremia.—In very severe cases uremic convulsions may occur. Severe headache and repeated vomiting, with scanty urine and deficient excretion of urea, are indications that uremia exists.

Convulsions.—The convulsion comes on suddenly and is bilateral. It may last but a few minutes, or it may last for several hours. The child may die in convulsions.

Fulminating Cases.—A form of acute nephritis which deserves particular attention occurs early in malignant scarlet fever. The

onset is very abrupt. But little urine is passed, and this is filled with albumin, casts, and blood.

Illustrative Case.—In a recent case complete suppression occurred without previous warning, and the child died in thirty-six hours, the duration of the entire illness being but seventy-two hours. There was no edema. The child became comatose, and died from the uremia and the intense scarlatinal poisoning.

Duration.—The duration of an attack depends largely upon the severity. Thus I have had cases well in one week, and others in which the urine was not free from albumin and casts for six weeks and sometimes longer. In case of apparent recovery I do not look upon the patient as fully recovered until twelve months have elapsed. I never allow a child who has had well-marked nephritis to pass from my observation within less than one year. A peculiarity of nephritis is its tendency to return. The chronic cases which we see, both in private and in hospital work, almost invariably give a history of two or more acute attacks, at intervals perhaps of several months. The second and subsequent attacks might have been prevented by proper protection and care.

It may, therefore, be put down as a fact that chronic nephritis in a child often means neglect, as much on the part of the family as on the part of the physician.

Prognosis.—The prognosis of severe acute nephritis is good if proper management is carried out from the beginning of the illness until at least one year has elapsed. The prognosis is bad in even a mild case if it is neglected. Nephritis is one of the diseases in which right management is most essential, even in very mild cases.

Diagnosis.—That nephritis is present is indicated by the appearance of swelling about the eyes and ankles, or by a more active onset of vomiting, fever, and headache.

Suspicion in any given case may be easily verified by a urine examination.

Examination of Urine.—If, during scarlet fever or any of the infectious diseases, the physician takes the precaution of having nitric acid and a few test-tubes at the home of the patient so that the urine may be tested for albumin at each visit, in addition to a reasonably frequent microscopic examination at his office, a nephritis may be detected before the more active clinical signs of the disease appear; and thus, by placing the patient promptly under suitable management, usually but little trouble will be experienced.

Treatment.—The treatment of nephritis, reflecting as it does the present methods of schools, in their advocacy of forced, indiscriminate water-drinking, the exclusive milk diet, and the more or less indiscriminate use of diuretic drugs, is often open to the most emphatic criticism. Every one of these measures is capable of, and has been productive of, no little harm. Too great emphasis has been placed upon forcing the kidneys to act, and too little upon the necessity of relieving them of the work for which they are temporarily incapacitated. The advocacy of drinking large amounts of water when the kidney blood-vessels are

distended, the tubules are obstructed, and the parenchyma is secreting but very little, does nothing but harm. Under such conditions heart stimulants, such as digitalis, which forces more blood into the kidneys, necessarily make a bad matter worse.

General Management.—In treating nephritis there are several factors to be kept in mind. Because a case is mild it should never be given scant attention. Nephritis in a child may be most insidious in its course. The mildest case, while not treated in all respects like a more severe one, should be given every possible attention relating to rest in bed and diet; for through neglect, even for a very few hours, a mild case may become most severe.

A child with nephritis must be kept in bed with the temperature of the room at about 70° F. He should be protected from drafts of cold air. Silk, a mixture of silk and wool, or flannel should be worn next to the skin.

Diet.—The nutrition of the patient is to be maintained by food which will not add to the existing trouble. We are told that nitrogenous food, such as meat and eggs, is to be avoided in order to relieve the kidneys from the work of excretion of urea and creatinin; and yet, often we are advised in the very next line to give a full milk diet, which, in the case of a child from five to ten years of age, means from two and one-half to three quarts daily. Milk, it will be remembered, contains 4 per cent. of nitrogenous food, necessitating that large amounts of nitrogenous waste by-products be excreted by the kidneys.

In order to maintain the nutrition of the patient, proteid is necessary, and may be supplied by the use of a moderate amount of milk. To a child from five to ten years of age, from 16 to 20 ounces of full milk should be given daily—never more than 20 ounces. This should be diluted with equal parts of cereal gruel, No. 1 or 2, with the addition of one teaspoonful of sugar (see formulary, p. 103), and given in quantities from 6 to 10 ounces at four-hour intervals. The taste of the food may be changed by the use of cereal gruels of different kinds. Zwieback and butter, stale bread and butter, prune-juice, simple fruit jelly, thin apple-sauce, and orange-juice may be given in order to improve the digestion and add variety to the diet. Inasmuch as milk and fruit cannot be taken simultaneously by many patients, the fruit may be given between meals or with a plain meal gruel, and thus increase the nutritive value of the daily ration. Broths and beef extracts are not to be given because of their creatinin content.

The Salt-free Diet.—The value of a salt-free diet in nephritis is now very generally recognized. The rationale underlying this treatment has been concisely set forth by L. Miller, who, after reviewing the work of Widal, Javal, and other observers, states the following conclusions:

"In patients with moderately severe nephritis associated with edema the ingestion of large amounts of sodium chlorid is followed by chlorid retention. The patient gains in weight, the edema becomes more marked, the albuminuria increases, and symptoms may develop resembling uremia.

"In patients with very severe nephritis, and especially those with uremia, chlorid retention is very marked, as scarcely any of the extra chlorid administered is eliminated.

"In individuals with apparently healthy kidneys, following the ingestion of sodium chlorid there is a chlorid retention equal to that of a mild nephritis. The individual gains in weight, but there is no visible edema, no albuminuria, and no uremic symptoms."

The degree to which defective kidney excretion is responsible for the edema of nephritis is still in doubt, but it is certain that exclusion of common salt from the food, including even such substances as bread, is frequently followed by marked improvement, which ceases on a return to the salt-containing diet.

Bowel Evacuation.—A patient with nephritis, no matter how mild, should have two bowel evacuations daily. These should be rather loose. The use of the fruit-juices may be sufficient to keep the bowels relaxed. If a laxative is necessary, citrate of magnesia, or, for very young children and infants, milk of magnesia, may be given in such doses and at such intervals as may be necessary to produce the desired results. The patient should always have an enema at bedtime if no passage has taken place during the preceding twenty-four hours.

Bath.—A warm sponge-bath should be administered daily, the patient being sponged and dried part by part under a flannel blanket.

Treatment of Severe Cases.—When there is fever with partial suppression of the urine, only one-half the usual quantity being passed, and that loaded with albumin, blood, and casts, with perhaps beginning edema, colon flushings (p. 763) with a normal salt solution at a temperature of 110° F. are to be used. The flushings have the effect of increasing the functional activity of the kidneys. For a child from five to ten years of age one pint of the warm saline solution may be thrown into the colon. An effort should be made to have the child retain the fluid by resting on the left side with the buttocks elevated on a pillow. For young children from eight to twelve ounces may be used. Infants under nine months may retain only four to six ounces. The flushings should not be repeated oftener than at twelve-hour intervals, unless the condition is urgent, as intolerance of the parts is readily brought about by too frequent manipulations.

If the skin is hot and dry and the temperature tends to remain above 102° F., tincture of aconite may be given in small doses. To a child three years of age, one-half drop may be given at two-hour intervals. Older children may be given one drop at a dose. It is rarely wise to increase the amount above two drops at two-hour intervals even for children above ten years of age. Only sufficient aconite should be given to produce a slight diaphoresis, for when the skin is kept constantly moist, the blood-vessels of the kidneys are relieved of the tension to which they have been subjected.

In the severer cases, with edema or anasarca, in which but two or three ounces of urine are passed daily, more active measures will be required. In these urgent cases the diet should consist temporarily

of thin gruels of barley, granum, or rice (No. 1), with sugar added to make them more palatable, and diluted fruit-juices given between the feedings. In a carbohydrate diet there are no by-products irritating to the kidney. Water should be given scantily, sufficient fluids being given in the food. Active measures to increase diaphoresis and thus relieve the kidneys must be instituted. The best method of doing this is by the use of hot colon flushings, hot packs, hot baths, and hot flaxseed poultices. In these severe cases the use of digitalis and alkaline diuretics does an immense amount of harm. Digitalis drives more blood into the kidneys and thus increases the congestion. The alkaline diuretics disturb the stomach, which is already showing signs of food intolerance. Colon flushings (p. 763) at 110° F. are to be used every six hours. This is probably one of the most valuable means we possess for relieving the congestion of the kidney and inducing a flow of urine.

Local Application of Heat.—Heat, either dry or moist, should be immediately employed in order to stimulate the skin to vigorous action. Dry heat and moist heat each has its advocates. Keeping the child in a warm bath at 105° F. for a few minutes, drying rapidly, and immediately putting him into bed, surrounded by hot-water bottles, will usually produce diaphoresis. A thermometer should be placed under the bed-clothing so that excessive heat may readily be detected. I have seen pronounced weakness produced by the use of excessive heat. The child should not be allowed to rest in a temperature higher than 120° F., and heat of this degree should not be maintained over ten minutes. A temperature of 105° F. or 110° F. may be maintained for an hour if necessary. If the pack is used, it may be repeated once in six hours. The disadvantages of a hot bath are due to the fact that it necessitates considerable handling, which to some patients is a cause of no little excitement. In such cases dry heat may be substituted, the patient being warmly clad in flannels, while hot-water bottles are placed near his body. This may be sufficient to induce perspiration. A device which I use consists of a funnel attached to a one-inch brass pipe, which is bent in the middle to a right angle and which conducts the warm air under the bed-clothing. The heat is generated by a kerosene lamp, over the top of which the inverted funnel is placed at a sufficient distance to allow combustion to take place. The Kilmer croup kettle has an appliance which may be used for this purpose (Fig. 41).

In some cases I have had satisfactory results from the use of hot flaxseed poultices made very large, 8 or 10 inches wide and 2 inches thick, and sufficiently long entirely to envelop the abdomen. These are to be applied as hot as can be borne at about twenty-minute intervals for one hour, and repeated again in three hours. This interrupted use of the poultices has been continued as long as nine days, with most marked benefit, both in private and hospital cases.

The Murphy drip may also be used, but it has not proved very successful. The pressure of the tube in the bowel for the long time required is not borne well by children, and occasions a great deal of restlessness

and irritability. I apply this means only in extreme conditions, in which the child's state is such that he is not annoyed.

While a free secretion of urine is desired in these cases, we must not be content with that alone. Uremia may occur even while the normal amount of urine is being passed. A quantitative test for urea should be made in all severe cases in order to determine the amount excreted. Normal urine, in children, contains approximately 2 per cent. of urea, which in health occasionally rises to 3 per cent. Approximately 0.5 gram of urea is excreted per kilogram of body-weight. The proportion in children is relatively higher.*

Treatment of Uremic Convulsions.—Vomiting is one of the first symptoms of uremia. When it occurs, all food should be temporarily withheld from the stomach and nutrient enemata given. Completely peptonized skimmed milk is our best means of nutrition, from 4 to 12 ounces being given every four to six hours. It is best to give the larger quantity at the longer interval,—every six hours is best,—as the manipulations with the tube have a tendency to produce intolerance on the part of the gut. The tube should be introduced at least eight inches into the bowel and the solution used should be lukewarm. Fluid at a temperature of 95° or 100° F. will best be retained. In addition to the use of colon flushings and external heat in the form of the flaxseed poultices referred to, uremic convulsions should be controlled with chloroform or the rectal administration of the bromids or chloral. To a child under three years of age, 2 grains of chloral may be given with 8 grains of bromid of soda. After the third year, 3 grains of chloral may be used with 8 to 15 grains of bromid of soda. This medicine is best retained when given in at least 4 ounces of mucilage of acacia or skimmed milk, the enema being repeated in four to six hours.

When heart stimulants are required, tincture of strophanthus is usually given—one or two drops at two-hour intervals to a child under three years of age. After this age two or three drops may be given. Digitalis is sometimes used as a heart stimulant during convalescence, after the secretion of the urine has been established.

Convalescence.—Convalescence is often tedious in these cases. The child should not be allowed to be out of bed until albumin has disappeared from the urine. For at least six months after an attack

* R. Bradford, in Allbutt's System of Medicine:

AMOUNT OF UREA EXCRETED ON THE BASIS OF 0.5 GRAM PER KILOGRAM.

1 year	Boys 9.29	4.645 gm. in 24 hrs.
	Girls 8.24[1]	4.12 gm. in 24 hrs.
3 years	Boys 14.14	7.07 gm. in 24 hrs.
	Girls 13.60[1]	6.80 gm. in 24 hrs.
7 years	Boys 22.44	11.22 gm. in 24 hrs.
	Girls 21.78[1]	10.89 gm. in 24 hrs.
10 years	Boys 30.22	15.11 gm. in 24 hrs.
	Girls 29.07[1]	14.535 gm. in 24 hrs.
13 years	Boys 40.04	20.02 gm. in 24 hrs.
	Girls 41.36[1]	20.68 gm. in 24 hrs.
16 years	Boys 56.09	28.045 gm. in 24 hrs.
	Girls 51.24[1]	25.62 gm. in 24 hrs.

[1] Figures of Boas, quoted from Holt.

the urine should be examined weekly. Light-weight woolens should be worn next to the skin during the entire year, and every effort made to protect the patient from sudden exposure to the influence of cold air. Upon the advent of any subsequent illness with fever, even though it should not occur for a year or two afterward, unusual precautions should be taken to protect the child, in view of a possible reinvolvement of the kidneys, with, possibly, a resulting chronic nephritis. Meat and eggs should be given scantily for a year after an attack. Exercise calling for more than ordinary muscular effort should not be allowed for at least a year after all trace of the nephritis has disappeared. I advise, when possible, that the winter after an acute attack be spent in a warm climate, such as that of Florida or Lower California.

CHRONIC DIFFUSE NEPHRITIS

This disease is rarely seen in children under three years of age. I see a goodly number of cases every year in children from the fifth to the twelfth year of age.

Nephritis of this type is almost invariably the result of an acute process which has run its course unrecognized or of faulty management following acute nephritis. A patient who came under my care three years ago with chronic nephritis gave a history of having had three distinct acute attacks during the previous four years, with intervals of apparent health. The urine had not been examined during these intervals nor had she had the advantages of proper treatment. Such a history is quite common.

Pathology.—In chronic parenchymatous nephritis (chronic diffuse nephritis without marked interstitial changes) the kidney is enlarged, pale, and of decreased consistence. The capsule strips easily, and the cortex, on section, is found to be wider than normal, and frequently of a light yellowish hue. The most pronounced microscopic changes are those found in the tubules, the epithelium of which undergoes a variable amount of granular and fatty degeneration and exfoliation. The glomeruli also may show hyaline changes, swelling, and cellular proliferation and desquamation. In some cases the disease is predominantly a chronic glomerular nephritis. Interstitial changes are not, as a rule, important. The urine may be cloudy, is usually of increased specific gravity, and contains albumin in variable amount, leukocytes, epithelial cells of renal origin, hyaline and granular casts, and occasionally red corpuscles.

Symptoms.—Chronic nephritis rarely develops insidiously as in the adult. Usually it is a continuation of the second, third, or fourth acute exacerbation. Instead of subsiding, the edema and the pallor remain pronounced, and the abnormal urinary findings persist.

Anemia is always present, and, as the condition progresses, digestive disturbances become manifest. The appetite is usually indifferent, and commonly there is vomiting. Other symptoms are marked edema and drowsiness. The progress of the disease is variable. There are periods when recovery seems at hand, and then all the symptoms return

in an aggravated form. Ascites is usually present in the advanced cases. Effusion into the pleural cavity and into the pericardium may be looked for. Pulmonary edema is a constant symptom a few days or hours before a fatal termination, if uremic convulsions are delayed.

Prognosis.—The patients are always the subjects of much solicitude. My results have not been brilliant. In some of my cases the illness began after an infectious disease, usually scarlet fever, and ran a slowly progressive course, which under the best of management defied every effort, terminating fatally in three months to a year. In other cases improvement occurred, casts and albumin disappeared from the urine, and the child was apparently well.

Exacerbation.—Even in favorable cases, however,—as the result of exposure, some intercurrent disease, or some unknown cause,—an exacerbation occurs, and the attack is repeated, usually in graver form than the previous one. The urine becomes scanty and loaded with albumin and casts; the child becomes edematous and pale. Treatment may perhaps relieve the condition, but this attack is followed by another in three to six months, after an interval of apparent health.

Illustrative Cases.—In one girl four years old five distinct recurrences took place before death, which occurred in the fifth attack.

A girl nine years old gave a history of chronic nephritis lasting two years. She made a complete recovery—at least there has been no recurrence in four years.

A boy aged four remained well for two years after an illness covering six months. After this period he passed from my observation.

Diagnosis.—The diagnosis is confirmed by repeated urine examinations. Albumin and casts may be present for a considerable period without other signs than anemia. The anemia, with puffiness about the eyes and swelling of the feet and ankles, is a most suggestive sign.

Treatment.—The management of chronic diffuse nephritis of only moderately severe type is to be considered with respect to four factors: diet, baths, exercise, and climate.

If the patient is confined to bed, the diet should be the same as suggested under Acute Nephritis. The food should be largely salt-free. Twenty ounces of milk may be given daily. If the child is up and about, meat may be given once every second day. Eggs should be excluded. In other respects the diet should be simple, as outlined for well children (p. 96), this being ample for nutrition.

The child should receive one warm bath—95° to 100° F.—daily, followed by brisk friction with a dry towel.

An outdoor life is of decided advantage. Exertion, however, should not be allowed to the point of fatigue. Contests or stress of any kind, mental or physical, should not be permitted.

If possible, the child should spend the colder months in a climate which is not subject to sudden or wide variations in temperature. The climate furnished by Florida or Lower California is advocated when the parents are financially able to give the patient this benefit. If, however, the patient must be kept in his home, which does not offer the advantages of an equable climate, great care should be exercised in preventing

sudden chilling of the skin surface. Woolens should be worn next to the skin at all seasons of the year. Frequent examinations of the urine should be made, not only for albumin and casts, but for urea as well. Sudden attacks of uremia may occur even while the patient is passing an excessive amount of urine.

The management of suppression and anasarca is very much the same as described for these conditions occurring in acute nephritis (p. 429).

Diuretics with which the physician is familiar and in which he has faith, may be given well diluted, so as not to disturb the stomach. In the severe forms of chronic diffuse nephritis I have yet to see a diuretic of the slightest value.

Fig. 53.—Chronic nephritis before Edebohls operation.

Fig. 54.—Same case as Fig. 53 after Edebohls operation.

Illustrative Case.—A three-year-old girl, a patient in the Babies' Hospital in my service, presented the typical picture of advanced chronic nephritis (see Fig. 53). The usual treatment with calomel, salines, colonic flushings, and hot packs and diuretics failed to make any impression. The urine presented the usual changes and was very scanty. After two weeks of unavailing treatment, during which period the child became constantly worse, the Edebohls operation of decapsulation of the kidney was performed by Dr. William A. Downes, of New York city. The kidney secretion gradually increased—the urine showing but a trace of albumin two weeks after the operation. The thirteenth day following the operation the child had lost 16½ pounds in weight and presented the appearance seen in Fig. 54. There was an interval of two weeks between the time of taking the two photographs.

During convalescence from the operation, however, the child developed a very severe colitis, from which she died six weeks after the operation. I look upon this

case as a remarkable demonstration of temporary value, at least, of decapsulation of the kidney. Unfortunately, the intercurrent colitis terminated life before the permanent effects could be determined.

CHRONIC INTERSTITIAL NEPHRITIS

Chronic interstitial nephritis is a very rare condition in children. I have seen but one case, that of a boy ten years of age.

Etiology.—The etiology is obscure. In the case referred to no causative factor could be discovered. A persistent toxemia from intestinal sources is the most logical explanation.

Syphilis, alcoholism, and the infectious diseases have all been looked upon by different authors as possible etiologic agencies.

Symptoms.—A wide range of symptoms is put down by authors. As my personal experience has been so meager, I can do no better than recite the symptomatology of the only case coming under my observation.

Illustrative Case.—This boy evidently had suffered from the disease for three or four years. There was a history of chronic polyuria, thirst, and enuresis. He was very small, very thin, and anemic. He was habitually tired and listless. The skin was dry and rough and appeared to be pigmented in spots. There was no suggestion of dropsy, and the boy had never been known to perspire. He passed from 60 to 90 ounces of urine daily. The specific gravity was low. The one specimen examined by me showed a specific gravity of 1002, no albumin and no casts. Death resulted from exhaustion and uremia.

Treatment.—The management of these cases is symptomatic.

PYELOCYSTITIS (PYELITIS)

Pyelocystitis, designated by some authors as cystitis and by others as pyelitis, is an affection of the bladder and pelvis of the kidney. The bladder is probably always involved, usually for some time before the pelvis is invaded.

It is a disease of infancy and early childhood, and occurs almost uniformly in females. I have seen but five cases in males.

In a case which was seen by me late in the illness a pyelonephritis had developed which caused the death of the child. The process had extended from the pelvis of the kidney to the kidney structure, which showed dozens of large and small suppurating foci.

Age.—The majority of the patients are under three years of age. Pyelitis may, however, occur at any age. My youngest patient was three months of age, the oldest, ten years. It is comparatively rare after the fifth year. Its occurrence in female adults does not concern us, excepting that it is the belief of not a few internists that the disease of childhood is carried over to adult life.

Etiology.—The infection, in the great majority of cases, is due to the colon bacillus. Any of the pyogenic bacteria, however, which gain entrance to the bladder and pass through the ureter to the pelvis of the kidney may cause the disease. Thus the staphylococcus, the streptococcus, the gonococcus, or the typhoid bacillus may be the cause. In one of my cases infection was due to the typhoid bacillus; in another,

to the staphylococcus. I have now seen a large number of cases of pyelitis, and with the exception of the one case of typhoid bacillus infection, they were all either preceded by an acute intestinal disturbance, or occurred independently of any illness. The facility with which the infection takes place in girls explains its frequency in the female sex.

I have observed two cases in which there was a bacteriuria,—a colon bacillus infection without pus,—but with the usual clinical signs of pyogenic infection.

Symptoms.—Pyelocystitis is a disease the chief symptom of which is sudden elevation of temperature. That children may have the disease without fever cannot be disputed. With or without some slight intestinal disturbance there is a sudden rise in temperature to 102° to 105° F. The rise is usually to the higher point, and is rarely accompanied by a chill. The temperature ranges between 101° and 105° F. for three

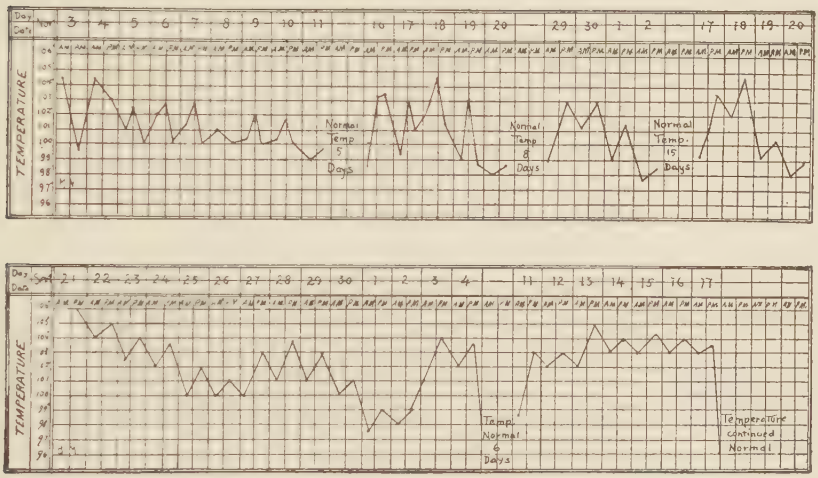


Fig. 55.—Temperature charts—pyelitis.

or more days, with remissions to normal. During the temperature period the child is fretful and uncomfortable, but not particularly prostrated. After the fever has passed the patient may appear slightly weak, but she is usually bright and manifests no great physical prostration; in fact, there may be no sign whatever of illness during the non-febrile period. The disease is often diagnosed as indigestion or some trivial ailment, and is forgotten until there is again a rise in temperature, which runs a high, irregular, or indifferent course for two or more days, and then again subsides. The accompanying chart (Fig. 55) represents an acute case of short duration. In a few instances the duration of an individual attack has been not more than ten or twelve hours. Malaria is not an infrequent diagnosis.

There is usually no pain in these cases, and no unusual frequency in urination. Very infrequently a case is encountered in which there are

bearing down and straining during and after urination. Absence of both discomfort and frequency of urination leads one to believe that cystitis in these cases is probably of a trivial nature.

The symptom above all others of value in this disease is temperature, and when we have distinct temperature periods in girls, such as are shown in the chart (Fig. 55), pyelitis will almost surely be found as the cause.

Diagnosis.—That pyelitis is present is suggested by the presence of fever not readily accounted for, in a female infant or young child. The diagnosis is verified by the finding of pus in the urine. Pus is not found in every specimen of urine voided. Before deciding that pus is not present in a given case, at least three specimens should be secured on different days.

For absolutely accurate work a catheterized specimen of urine should be secured, particularly if the urine is to be cultured. This is not absolutely necessary, however, in a routine diagnosis. If the child is carefully washed before urinating and the urine is caught in a sterile vessel, there will not be sufficient contamination to prevent a right conclusion.

Differential Diagnosis.—The diseases most frequently confused with pyelocystitis are malaria, typhoid fever, and acute intestinal infection. The distinct temperature periods and remissions, with days of normal temperature, effectually exclude either typhoid or malaria. The continuation of the temperature periods, after the intestinal intoxication is relieved, effectually excludes the intestine as the source of the fever. Repeated urine examinations confirm or disprove the presence of pyelitis. In doubtful cases the catheterized specimen of the urine should be cultured.

Duration.—The duration is variable, and appears to depend more upon the time the disease has existed unrecognized than upon the nature of the infection.

A patient in whom the condition is discovered early usually responds promptly, and perhaps does not have a second fever period. Others in whom the disease has existed for several weeks undiagnosed may require several months of treatment. My longest case under treatment was eighteen months. The child had suffered from undiagnosed pyelitis four months before coming under observation. It is not at all unusual for a case to continue over two or three months. In one case the disease reappeared after an absence of fever and pyuria for three months. In another case the disease reappeared after six months and in another after eleven months. Whether these cases represent a continuation of the old process, or reinfection, it is impossible to say. I am inclined to take the latter view. A case should not be pronounced cured under six months, even though there is no return of the fever. The urine, during this time, should be frequently examined for pus.

Treatment.—The readiness with which pyelitis responds to treatment depends considerably upon the duration of the infection. In the acute cases urotropin usually gives satisfactory results; 14 to 16 grains

are to be given daily, from 2 to 3 grains at a dose. I have not employed the larger dosage of 40 to 50 grains daily, as advocated by Freeman. In the chronic cases, those in which the disease has existed for some weeks or months, potassium citrate in large doses appears better to answer the purpose. In using the potassium salt large dosage is required for effectual work—10 grains four or five times daily. Whether the urotropin or potassium citrate is used, it is best at intervals to allow a few days of rest from medication, after which the treatment may again be resumed.

The difficulty that I have experienced has been to obtain sterile urine. The fever is usually readily controlled, but pus and bacteria remain in the urine over long periods.

Time Required for a Cure.—The urine should be free from pus for a period of at least six months before a case may be pronounced well.

Vaccine Treatment.—The use of vaccines has not been followed by brilliant results.

The application of this method of treatment to urinary infections in children should, therefore, at present be limited to rare cases of gonococcus or staphylococcus origin, and to the very small group remaining, which do not respond to medicinal measures. In persistent chronic cases vaccine should be given a trial.

The Bladder

CYSTITIS

Cystitis in boys is very unusual. In girls it occurs frequently. It is not of infrequent occurrence in hospital work.

Etiology.—The most common bacteriologic agent in the causation of cystitis is B. coli communis; next in order of frequency is B. proteus. The presence of these intestinal bacteria is explained by the fact that intestinal disease usually precedes cystitis in children.

Streptococci and staphylococci have been found in the urine in cystitis. Gonorrheal cystitis in children is extremely rare, and tuberculous inflammation of the bladder is uncommon, even in older children.

Symptoms.—Frequent calls for urination constitute the most usual symptom; so urgent is the desire to void the urine that the child may be unable to reach in time a place suitable for the discharge. Incontinence by day and night is usual in children with only a mild degree of bladder involvement. There is, ordinarily, but little pain attending urination. Sometimes there is evidence of distress at the completion of the act, but this is unusual. Inability voluntarily to control the urine during the day, extending over a considerable period of time, points to bladder involvement due either to the presence of stone, which is most unusual, to cystitis, or to a congenitally small bladder.

Diagnosis.—Frequent urination due to transient congestion at the neck of the bladder may be confused with cystitis. Such cases, however, are of very temporary duration, and respond readily to treatment, while the urine examination fails to show evidence of bladder

infection. Pyelocystitis or pyelitis may be confused with simple cystitis. In cystitis without involvement of the kidneys the fever, which may signalize an infection of the pelvis of the kidney, is lacking. It is almost impossible to say positively when the pelvis becomes involved and when a cystitis becomes a cystopyelitis, for a cystopyelitis may exist for weeks without an elevation of the temperature. In all cases of involvement of the pelvis, however, there probably was a preceding cystitis. Temperature, when present, is a determining factor in establishing the diagnosis of pyelitis; further, when there is pyelitis, epithelium from the pelvis of the kidney is in evidence in the urine.

Treatment.—The treatment consists largely in the use of internal medication. Most cases respond promptly. Now and then a chronic case is seen which proves most obstinate. A case of this nature was observed at the out-patient service at the Babies' Hospital. The patient, a girl, came with a cystitis well established. Large quantities of pus were present in every specimen of the urine examined. In this case six months' treatment with bladder-washings and medication was required before the patient could be considered improved. She then developed poliomyelitis and passed from observation.

Irrigation of the bladder may be attempted. It has been of very little service in my hands. Bladder-washing is carried on with no little difficulty and annoyance, and usually with unsatisfactory results. My best success has been obtained by the use of urotropin, given in doses of 3 grains 3 times daily to a child three years of age. In cases due to the colon bacillus, which means nearly all cases in children, it is well to alternate the urotropin with potassium citrate, 10 grains of which are given 3 times daily. The urotropin is best given alone for five days, after which potassium citrate should be given for the same time, alternating thus, when necessary, until a cure is effected.

Of late I have been using sodium benzoate, 2 to 4 grains, with urotropin in equal dosage, with satisfactory results. The frequent urination is relieved, and the successive examinations of the urine show a gradual disappearance of the pus.

VEISCAL CALCULUS (STONE IN THE BLADDER)

Stone in the bladder is rarely seen in children under ten years of age. Four cases only have come under my observation. The patients were boys aged respectively three, four and one-half, five, and seven years. In each case there was cystitis, with frequent and sometimes impeded and painful urination.

The management is entirely surgical.

EXSTROPHY OF THE BLADDER

Exstrophy or eversion of the bladder is a rare deformity, affecting, in most instances, the male sex. This condition is due to a defect in the anterior wall of the bladder and to failure of development in the abdominal wall. Through the existing hiatus the posterior portion of the bladder protrudes as a mass covered by reddish mucous membrane,

on the surface of which the urine from the ureteral orifices is discharged. Other malformations usually exist, of which the most important are non-union of the pubic bones, absence of the penis or epispadias, absence or non-descent of the testis, and hernia. In the female the embryonic cloaca representing bladder, vagina, and rectum may persist. A determination of the sex of the patient is occasionally difficult.

The condition is most pitiable. The constantly discharging urine makes cleanliness impossible, and the odor of decomposing urine is always present. No means have been devised for a satisfactory collection of the urine. My own cases have all been seen in hospitals. In these instances abundant cotton in a large pad was bound on the parts and frequently changed. The skin surface round the exstrophy should be protected with U. S. P. zinc ointment, to which 10 per cent. of white wax is added and applied on linen. This makes a fairly satisfactory water-proof dressing and prevents the distressing excoriation of the skin.

Operation.—The operation for deflecting the ureters to the sigmoid or rectum, while rarely successful, should be attempted.

After the ureters are successfully placed, there is always the danger of a pyelitis. Cases are recorded, however, in which the results of the operation have been most satisfactory. I know of one such instance. In this case the readiness with which the rectum assumed the bladder function was as surprising as it was gratifying to the patient. The rectum holds the urine from three to six hours without inconvenience.

Various plastic operations have been advised, the object being to secure a bladder orifice to which some portable urinal may be applied.

The Male Genitals

Practically every male child is born with an adherent prepuce and with more or less constriction at the preputial outlet. The penis is to be considered normal only when the foreskin can easily be retracted, laying bare the glans.

The adhesions and constrictions may be relieved by moderately stretching the foreskin and breaking up the adhesions with a fine blunt probe, after which the glans should be cleansed, oiled, and the foreskin drawn forward over it. The cleansing of the parts with Castile soap and warm water, which necessitates a retraction of the foreskin, should be practised at least every second day on the uncircumcised. This not only keeps the parts clean, but prevents the later formation of adhesions and a possible phimosis.

Circumcision should be performed upon every male child. The operation does away for all time with the necessity of manipulation of the parts. (See p. 447.)

BALANITIS

Balanitis is a swelling and inflammation of the foreskin due to a local infection. Unskilled manipulation in stretching the prepuce readily produces a laceration, opening up a means of entrance for bac-

teria. In severe cases the parts first show congestion and then edema. I have seen patients with long foreskins which were twisted and swollen to a size three or four times that of the penis. In advanced cases there will be suppuration beneath the foreskin, with a purulent discharge from the orifice.

Treatment.—If the case is seen early, wrapping the parts in gauze or old linen, which is saturated with an ice-cold solution of bichlorid of mercury 1:10,000 and changed every half-hour, will usually be effective. If there is much edema, puncturing in several places, after disinfection, should precede the wet dressing. If there is a purulent discharge, the sac should be gently syringed at least twice daily with a 3 per cent. solution of hydrogen peroxid, diluted one-half with water.

When the suppuration has ceased, with a return to normal of the parts involved, circumcision should be done. Operation during the acute stage, particularly with suppuration present, should be avoided unless the condition is very urgent.

PHIMOSIS

Phimosis consists of a constriction or narrowing of the preputial orifice, sometimes to a pin-point. In cases where the foreskin is tightly bound to the glans by adhesions the urine may be emitted in drops; in other cases the prepuce "balloons out" during urination and the urine dribbles away. The opening may be sufficiently large to show under pressure the margin of the urethral opening, in which instance urination will be but little interfered with.

Phimosis may be productive of various nervous manifestations, such as restlessness and irritability. It may be a cause of retention of the urine. In two of my cases convulsions were apparently caused by phimosis. Both children had repeated convulsions until they were circumcised. Both suffered from marked phimosis, with retention of smegma and irritation of the prepuce.

Treatment.—The cases in which urination is impeded require prompt relief. This can be furnished temporarily by introducing a small probe or a director and carefully slitting the skin with sharp-pointed scissors until the glans is reached. The child should be carefully held by an attendant during the operation and great care should be exercised in introducing the director. After the operation a wet dressing of bichlorid of mercury 1:10,000 or a saturated solution of boric acid should be applied to the wound until it is healed.

A few years ago I saw a case in which the probe had been introduced into the urethra and followed up by the scissors, which had made a slit involving one-third of the glans.

Circumcision should never be long delayed in cases of phimosis, as it furnishes the only satisfactory means of relief. Stretching is very apt to be followed by recontraction, which only intensifies the original condition, while the unavoidable laceration of the mucous membrane may open a favorable field for infection. In hospital and out-patient work examples are numerous of the harm resulting from force and lack

of cleanliness in the management of this simple and easily remedied condition.

PARAPHIMOSIS

Paraphimosis is produced by the retraction of a tight foreskin, which later becomes so contracted behind the corona as to prevent the return venous flow. As a result, the glans becomes greatly swollen, deeply congested, and edematous. Urination is impossible. The cases which I have seen have all been produced by the mother or nurse in an attempt to retract a tight foreskin according to the doctor's directions, after he had stretched the prepuce for phimosis.

Treatment.—If the retracted skin is edematous, it may be punctured in various places to let out the fluid. Reduction may then be attempted by taking the glans between the thumb and the first and second fingers of the right hand and making gradual pressure backward against the thumb and first finger of the left hand, which grasps the penis behind the prepuce. If the reduction cannot be effected in this way, as occasionally happens if the case is of long standing or the contraction very tight, a longitudinal dorsal incision may be made in the skin at the site of the constriction. After the reduction a wet dressing of a saturated solution of boric acid or of bichlorid of mercury 1:10,000 should be kept constantly applied to the parts until the swelling has subsided. Then circumcision should be done.

CIRCUMCISION

Should circumcision be practised as a routine measure? There is not the slightest doubt that it would be for the best interest of every male infant if he were circumcised. The operation during the second week of life is a trivial matter. In one out of every five male infants circumcision is a necessity both for comfort and health. In marked degrees of phimosis and balanitis circumcision is the only means of relief.

An important reason, to my mind, for the operation as a routine measure, is that it settles at once and for all time the toilet of the parts. The penis after a proper circumcision requires no further manipulation on the part of the nurse. The daily retraction of the foreskin and bathing of the parts is one of the best means of teaching the child self-abuse. When the parts are not attended to every day or at least every second day, trouble is sure to follow sooner or later, in the form of adhesions and inflammation of the prepuce. The sensations produced by the retraction and the washing are not unpleasant and the child soon learns to produce them himself, through leg rubbing, hand pressure, or other means. (See Masturbation, p. 465.) Time and again, after having stretched the foreskin and broken up the adhesions because operations were refused, I have had the case return in a few weeks with the adhesions and the contractions as bad as before, the nurse or mother, timid or neglectful, having failed to follow my directions. In case of phimosis it may require considerable skill to draw the foreskin forward after a

retraction. It is not always safe to permit the attendants to attempt it. Not a few times I have seen a paraphimosis (p. 447) which resulted from an inability to bring forward a retracted tight foreskin.

The dorsal slit, so often practised as a substitute for circumcision, is to be used only as a temporary expedient, and as such may be employed whenever circumcision is refused. Never, by any means, does it take the place of circumcision, but invariably leaves a long, redundant flap of skin, which easily becomes irritated, causing no little discomfort. For the child, it also is a great temptation to manipulation.

UNDESCENDED TESTICLE

During the latter part of fetal life the testicles rest in the scrotum. At the termination of the ninth month they descend to the scrotum, and under normal conditions are found there at birth. In a considerable number of infants, however, one or both testicles remain in the canal for varying periods, the descent usually taking place during the first year. When such descent does not occur, the condition may be considered abnormal.

In small children usually no inconvenience is caused by the malposition of the organ. I have repeatedly found one or both testicles in the canal in children up to the sixth year. The testicles may be brought down, but disappear as soon as traction is removed. In older boys, after the sixth year, the condition may cause trouble because of the exposed situation, which subjects the organs to possible injury in play. Further, if they are left in the abnormal position, the question of possible faulty development is to be considered.

It is important not to confuse this condition with inguinal hernia, hydrocele, or enlarged inguinal glands. On several occasions I have known a truss to be applied to an undescended testicle.

Treatment.—While I have known boys to arrive at the age of ten years before the permanent descent occurred, I do not believe waiting to be a wise routine procedure. If the testicle is freely movable and can be brought into the scrotum, it is safer to wait. Nature will cure the condition. When the testicle is fixed and cannot be brought into the scrotum, I favor early operation—at least, not later than the sixth year. In these cases there is a shortening of the cord, with adhesions, which prevents the descent. The operation is almost always successful.

ORCHITIS

Orchitis is a most unusual disease in the young. I have seen but two cases, both complicating mumps. The disease may also be due to gonorrhea and to trauma. Tuberculous orchitis and specific orchitis occasionally occur, but are exceedingly rare. The disease may be accompanied by hydrocele. When epididymitis is present, it may usually be traced to an injury or to an existing specific urethritis.

Pathology.—The inflammation in the epididymis is essentially catarrhal, but may involve the interstitial tissue and extend to the testis. In the latter organ interstitial changes ordinarily predominate.

Symptoms.—The process is seldom attended by suppuration, though the inflammation may be so severe as to cause fever and other mild constitutional symptoms. Local manifestations are pain, swelling, increased heat, slight redness, and occasionally some edema of the scrotum.

Treatment.—The management necessitates rest in bed, the use of saline laxatives, if necessary, and support of the inflamed testicles by a wide strip of adhesive plaster extending from thigh to thigh. The application of warm sedative lotions gives much relief from the pain and discomfort, and appears to shorten the duration of the attack. Lead and opium solution, U. S. P., applied on several layers of gauze and covered with cotton-wool, should be renewed every three hours. After the acute symptoms have subsided a suspensory bandage should be worn for several months.

HYDROCELE

Hydrocele is an excessive accumulation of serum in the peritoneal process enveloping the testicle and epididymis. In children the condition is usually congenital, although it may be unapparent at the time of birth. Hydrocele is also sometimes caused by direct injury.

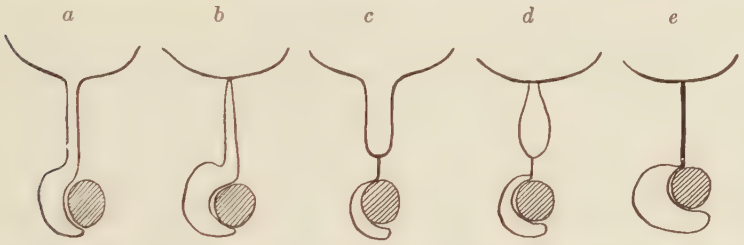


Fig. 56.—Varieties of hydrocele: *a*, Congenital; *b*, infantile; *c*, funicular; *d*, encysted; *e*, vaginal (Da Costa's Modern Surgery).

The affection is commonly described under a classification of the following forms:

(*a*) *Congenital Hydrocele.*—This exists when the funicular process remains patent, and is frequently accompanied by hernia. The tumor is translucent, elongated, oval, and fluctuating, and is reducible under pressure without special manipulation. When uncomplicated, this swelling, in distinction from one produced by hernia, affords only a dull percussion-note and fails to emit a gurgling sound on reduction.

(*b*) *Infantile Hydrocele.*—This type is distinguished from the foregoing by the fact that the funicular process in the upper portion of the canal is closed. The fluid mass is elongated and irreducible.

(*c*) *Hydrocele of the Cord (Funicular Hydrocele).*—Simple hydrocele of the cord is occasioned by the closure of the canal in its lower portion, while the funicular process above remains open. Such a condition is not usual. The hydrocele is separate from the scrotum and may be associated with a hernia.

More frequently the canal is closed at both its upper and lower portions, while the intervening part remains open and is distended by an accumulation of fluid.

(*d*) *Encysted hydrocele of the cord* is small, translucent, elastic, and irreducible, and may resemble an enlarged lymph-gland or an undescended testicle.

(*e*) *Hydrocele of the Tunica Vaginalis, with Normal Obliteration of the Funicular Process.*—"Common vaginal hydrocele" is firm, tense, fluctuating, and irreducible. Above the upper limit of the swelling the cord may be distinctly felt.

Treatment.—The cure of hydrocele in infants is usually spontaneous. When the hydrocele is exceedingly large, aspiration of the fluid under rigid aseptic precautions may produce a permanent good result. In cases of the congenital variety, especially those associated with hernia, the wearing of a truss is important as a means of assisting in the obliteration of the funicular process. Injections of irritants have not been necessary in my cases. Such a procedure is rarely to be advised. I have seen much harm done by punctures and injections into the sac. Several severe cases of infection of the parts have resulted from such procedures.

GONORRHEA IN THE MALE

Specific urethritis in male infants and male runabout children is of rare occurrence. But five patients under four years of age have come under my observation. The oldest of the group, aged four years, developed a stricture. The boy's home was in a tenement, and he had been repeatedly exposed through another member of the family, who hoped to rid herself of the trouble by giving it to the boy. The four other cases, aged sixteen months to two years, occurred in children's institutions, in which there was an epidemic of specific vaginitis.

Treatment.—The younger boys appear to respond unusually well to an irrigation of 8 ounces of a 1:10,000 permanganate of potash solution used twice daily.

All recovered without strictures.

EPISPADIAS AND HYPOSPADIAS

Both of these abnormalities are congenital defects in the development of the penis, characterized by imperfect closure of the urethral groove.

In most cases of *hypospadias* the urethra terminates before reaching the base of the glans. In *epispadias*, which is much less common and frequently accompanies exstrophy of the bladder, the urethra opens upon the dorsum of the penis.

The simpler forms of hypospadias may not require treatment, particularly if the urethral opening is within one inch of the normal position of the meatus (Wyeth). When, however, the malformations present imperative demands, plastic surgery should be attempted.

The Female Genitals

VULVOVAGINITIS (SIMPLE)

In simple vulvovaginitis there is an inflammation of the mucous membrane of the external genitals, with a slight involvement of the vagina in its lower portion. Further extension of a non-gonorrheal infection to the uterus and tubes probably never occurs.

The orifice of the urethra is usually reddened and inflamed.

Etiology.—Ill-conditioned children, and those improperly cared for, furnish the majority of the cases. Now and then an apparently healthy girl will develop the disease.

Irritation from hand manipulation in masturbation, scratching in eczema, thread-worms, and constipation may all bring about the discharge. The ailment is particularly common in anemic girls whose vitality is habitually below normal.

Symptoms.—There is moderate itching and burning of the parts and a secretion of rather viscid mucus. In some cases there is a yellow, purulent discharge, resembling that of gonorrheal infection. The attention may be first called to the condition because of a staining of the clothing.

Diagnosis.—The condition in which there is a purulent discharge requires to be differentiated from gonorrheal vaginitis. This is very readily done through bacteriologic examination. Without the aid of the microscope differentiation is impossible.

Prognosis.—The prognosis is favorable. Most cases recover in a few weeks. Resistance to treatment and chronicity point to the presence of the gonococcus.

Treatment.—The management comprises both constitutional and local measures. The patient should be given a daily living régime. In these cases I direct when the child shall rise in the morning, when she must retire, and the amount of rest she must take in the middle of the day. In this way the output of energy is curtailed and waste is prevented. The diet is so arranged as to give the patient the most nutrition with the least amount of digestive activity. Bitter tonics, cod-liver oil, and iron are given when indicated. As much out-of-door life as is possible is encouraged. In short, the measures advocated in the section on Delicate Children (p. 134) are applicable here.

Local Measures.—Bathing the genitals twice a day with warm water and Castile soap, followed by drying with absorbent cotton, prepares the parts for an absorbent dusting-powder, which I have found useful in these cases. The powder used is of the following composition:

℞ Acidi borici . . . . . gr. xxv
Pulveris amyli,
Pulveris zinci oxidi . . . . . āā ʒss

The more nearly dry the inflamed surfaces are kept, the more prompt will be the relief. If there is a tendency to a free secretion of mucus, the powder may be applied at intervals of two hours.

A convenient means of applying the powder is with an insufflator, which may be obtained from any apothecary. After the parts are packed with the powder, a dressing of old linen should be applied and held in position by a napkin binder. The powder should be reapplied often enough to keep the parts dry.

I have known many cases of long standing to respond promptly to the above management.

GONORRHEAL VULVOVAGINITIS (SPECIFIC VAGINITIS)

Vaginitis of this type is very prevalent among the congested tenement population in all large cities. Institutions for children, if they would admit the patients, could always supply a goodly number of cases.

Etiology.—It is almost impossible to keep the infection out of institutions, and when it once enters, it is most difficult to remove. The disease is quite distinct from venereal disease in the adult, in that it is contracted through indirect means. The hands of the mother or nurse, towels, napkins, the thermometer, may all furnish a means for transmission from the infected to the healthy. Day nurseries, most necessary institutions, are often unwittingly distributing agents of the gonococcus.

At the New York Nursery and Child's Hospital I have labored with this disease for several years with most discouraging results. For the reason that this is a city institution, cases with vaginitis must be admitted and the institution is never free from the disease.

In private work I have known of several cases in which the mother had a vaginal discharge of a suspicious character. In two cases only the disease was evidently contracted from a nursery maid.

Age.—No age is exempt. I have treated infants of six weeks with the infection. In older girls, after the tenth year, the possibility of infection through sexual contact may be considered, but even at this age the disease is most unusual; in fact, very few cases are seen in children after the eighth year. Very young females—under three years of age—furnish most of the cases.

A resistance to the special forms of transmission of the infection appears to be acquired with advancing years. The nursery maids in training will live for months in an infected ward, working with the patient, and not become infected, whereas if a healthy female infant is placed at any point in the room, she will become infected in twelve to thirty-six hours; practically none escape.

A female child six months of age, admitted into a ward maintained with care and cleanliness, containing 12 healthy females of about the same age, will transmit the disease to one-half of the number in two or three days.

Symptoms.—Redness of the vulva may be apparent without discharge, or there may be a mucous, mucopurulent, or purulent discharge.

The typical discharge is thick, viscid, and of a greenish-yellow color. If the case is of considerable duration, there will be redness and excoria-

tion of both mucous and skin surfaces. There is a good deal of itching and discomfort. In older children micturition may be painful. In infants no discomfort whatsoever appears to be occasioned by the disease.

Extension of the infection through the uterus to the tubes and pelvic cavity is of most unusual occurrence. I have seen hundreds of these cases, but never saw a complication of this nature. The inflammation very rarely extends beyond the cervix. An endocervicitis, however, is usually present.

Diagnosis.—The presence of a vulvovaginal inflammation with or without discharge suggests the possibility of a specific vaginitis. It is a mistake to suppose that there must be a visible discharge in each case. Time and again smears taken from a vagina that is simply moist will show the gonococcus.

Microscopic examination of the secretion promptly decides whether or not the case is of gonorrheal origin.

Complications.—The most frequent complications are conjunctivitis and arthritis. Conjunctivitis is the one most commonly encountered. Arthritis (p. 636) is not at all unusual. I have seen at least 30 of these cases.

Prophylaxis.—This disease is the most infectious of all infectious diseases. In order to prevent its spread in a family in which there are two or more girls, or in an institution, it is necessary not only to prevent personal contact, but also to prevent any association of any nature whatever, and this includes attendants, clothing, feeding and cooking utensils, and thermometers.

It seems almost impossible for nurses in attendance in vaginitis cases not to convey the disease to well female infants. At the New York Nursery and Child's Hospital we were obliged to put the children in a separate building, with nurses who cared for them only. Cheese-cloth napkins were used, which were burned. All other clothing and bed-linen was boiled before being taken to the general laundry.

Treatment.—The course of the disease is most protracted, and there is no specific medication which we may use either locally or internally. I have treated hundreds of these cases in many different ways, including the use of solutions of bichlorid of mercury and of permanganate of potash of different strengths. I have used the various silver salts in different strengths as applications to the parts. I have learned, in treating a vast number of these cases, that keeping the parts clean through douching does more toward terminating the disease than does the use of any particular disinfectant wash or application. Douching of the parts is to be practised four times daily, if possible, with the use of two quarts of water. It is useless to attempt the treatment of a case without provision for douching at least twice a day. It may be remarked that this is a very trying treatment for both patient and nurse. Such is certainly the case, but we are dealing with a disease in which only strenuous measures give hope of cure. In order to receive the douche most effectively the child is placed on the back on a douche-pan. A glass female catheter attached to a fountain-syringe is all the apparatus

required. The catheter is passed about one-half inch within the vaginal orifice, and the water allowed to run. The lower end of the bag should not hang higher than two feet above the child's body. Boric acid is a safe drug in any household. For this reason it is selected instead of bichlorid of mercury, permanganate of potash, or any other antiseptic. I am not at all sure that plain boiled water would not answer just as well. It would be difficult, however, to persuade many families to use the repeated douching without the addition of some antiseptic to the water. Accordingly, the mother or nurse is instructed how to prepare two quarts of a saturated solution of boric acid. This is used as a cleansing agent. After the parts are dried with sterile absorbent cotton, a dusting-powder the formula of which is as follows is used very freely:

℞ Acidi borici . . . . . gr. xxv
Pulv. amyli,
Pulv. zinci oxidi . . . . . āā ʒss

The powder is freely dusted into the vagina and over the diseased surface after the douche, and at two-hour intervals, during the time the child is awake, from early morning until late at night. I tell the attendants to *pack* the parts with the powder. Over this is placed absorbent cotton or gauze, which is covered with the napkin. The attendants should be warned of the danger of infecting themselves and other children in the household with towels, sponges, etc.; in fact, sponges should never be used in these cases. The danger of infecting the eyes, not only of the patient, but of the attendants and others who may come in contact with the case, should be carefully explained. When washing or drying is necessary, absorbent cotton or old linen should be used and immediately burned. A child suffering from gonorrheal vaginitis should sleep alone. Cheese-cloth napkins should be used and burned as soon as soiled.

A case treated as above may recover in three weeks, though usually from four to eight weeks are required, and in some cases the treatment must be continued for months. After we have arrived at a point where we consider the case cured, there will sometimes be a renewal of the discharge; the treatment must then be resumed.

Before the case is finally discharged, at least two bacteriologic examinations of the vaginal secretion should be made in order to determine positively the absence of the gonococcus.

What becomes of the many cases in which the treatment is not continued or the cases that are never treated? I am confident, from the large number of infant females who have the disease and its absence in older children after the sixth year, that cure takes place spontaneously, without after-results. The gonococci become fewer in number and eventually disappear.

Vaccine Treatment.—Treatment of the disease with the vaccines offers no better results—probably not as good results as are obtained by local cleanliness.

In a series of 36 cases at the New York Nursery and Child's Hospital

the vaccine treatment was carefully carried out by Dr. Wm. A. Murphy, the resident physician. The plan of dosage was to begin with 50,000,000 dead organisms and increase 10,000,000 at a time, giving the injection at five-day intervals. A girl of eleven months was given 7,050,000,000 without a cure. Another girl of two years who received 6,610,000,000 afforded continuous positive findings. Another, twenty-six weeks old, received 4,030,000,000 and remained positive. The largest amount given one patient was 18,300,000,000. She was well in two months and one week. No other case showed three successive negative cultures, at five-day intervals. under three months' treatment.

15	cases	received	less than	1,000,000,000
3	cases	received	between	1,000,000,000 and 2,000,000,000
4	"	"	"	3,000,000,000 and 4,000,000,000
8	"	"	"	4,000,000,000 and 6,000,000,000
6	"	"	"	6,000,000,000 and 8,300,000,000

Our results were no better with vaccines thus administered than were obtained by douching and the use of disinfectant powders.

ATRESIA OF THE URETHRA AND VAGINA

Atresia of the Urethra.—This is a congenital occlusion or stricture of the urethra, due to agglutination of the walls or closure of the meatus urethræ by membrane. The obstruction is often incomplete.

Treatment.—In some instances simple incision at the meatus may relieve the condition. The other cases will require urethrotomy, combined, perhaps, with forcible catheterization.

Atresia of the vagina may be due to imperforate hymen (atresia hymenalis) or to the presence of a transverse septum obstructing the passage at a higher level. A rectovaginal fistula may coexist with the atresia. Atresia of the vagina has been recognized as a cause of hematocolpos, hematometra, and hematosalpinx. The possible existence of this malformation should be considered in all cases of delayed menstruation.

The *treatment* is surgical.

XIII. NERVOUS DISORDERS

HEADACHE

A complaint of headache, particularly repeated headache, on the part of a child should always be respected. Its occurrence is of greater import than in the adult.

In children of any age headache may be an early symptom of meningitis, particularly of the tuberculous form, in which the headache may exist for days without other signs of illness. In eye-strain headache is a very prominent symptom, and may be the only evidence that an ocular defect exists. In cases of persistent headache that cannot otherwise be satisfactorily explained I invariably have the eyes examined. Headache is often the earliest sign of acute infectious disease; it is a premonitory symptom of scarlet fever, measles, or pneumonia. Persistent toxemia from any source may be a cause of headache. Such toxemia may occur in nephritis and in malaria. The most usual source, however, is the intestinal tract. With persistent toxemia of intestinal origin, anemia is generally associated. This condition may exist without constipation. Fatigue, as a result of overwork at school, or hard play and unusual excitement, may be a cause of headache in neurotic children. Late in the school year it is frequently encountered in girls. Examination of the urine may show marked indicanuria. Children are imitators of adults, and in a family with the headache habit the child may complain when the condition does not exist. Such simulation may readily be interpreted.

Treatment.—The management of headache consists in the discovery and removal of the cause. An ice-bag or an ice-cloth applied to the head affords much relief in the acute febrile cases. Ocular defects should have the benefit of rest and suitable glasses prescribed by an oculist. Fatigue headaches are best controlled by limiting the amount of work and providing long periods of rest. Headaches due to intestinal toxemia with the usual accompaniment of anemia are often most difficult to relieve. In spite of our best efforts, the intestinal digestion may remain faulty for a considerable time. A change of residence and a radical change in the habits of life are usually the best means of effecting a cure. The management of these cases is considered in detail under Persistent Intestinal Indigestion (p. 210).

PAVOR DIURNUS

Day-terrors are of occasional occurrence. My cases have all been due to intestinal toxemia in children who showed very poor milk capacity. The fright has never been as severe as that occurring at night.

Illustrative Cases.—A boy, two and one-half years of age, asked his nurse to brush the bugs off his lap-robe and clothes. When the nurse failed to discover the

bugs, the boy attempted to brush them off himself. When asked what kind of bugs they were, he repeated "all kinds."

A case almost identical with the foregoing was that of another boy three years of age.

A girl four years of age would suddenly stop her play and hold conversation with imaginary people or objects and maintain that the people were present, and describe their appearance and dress. As suddenly she would return to play. At these times it was with difficulty that the child could be brought to her normal condition of mind.

In all these cases there was chronic intestinal indigestion, with heavily coated tongue and foul breath. The children recovered entirely upon relief of the intestinal condition.

Uncontrollable attacks of screaming in young children have been attributed to pavor.

NIGHT-TERRORS (PAVOR NOCTURNUS)

In night-terrors the child arouses from his sleep, thoroughly frightened, imagining that animals or persons are trying to injure him. He begs to be protected. The following morning he has no recollection of the occurrence, and is rather amused than annoyed at the episode.

Etiology.—In a great majority of the cases the trouble is due to a deranged digestion in a neurotic child. This, however, is not necessarily the case. I have repeatedly known apparently healthy children to have the attacks. In my most recent case the terrors were due to excessive fatigue.

Illustrative Case.—The boy, four years old, had been treated elsewhere and had received careful medication and diet. The attacks continued nearly every night for a year. The mother stated that her own health and the boy's were badly affected because of the broken night's rest, and she looked upon the condition as very serious. Upon learning every detail of the boy's life I discovered that there was an older and very active brother of six years with whom the patient played daily, and who acted as a pacemaker for the patient. The older boy was sent from home, and a quiet, uneventful life was prescribed for the younger boy. There was no change in diet, as this was not necessary. For one week 8 grains of bromid of soda was given at bedtime to break the habit. During the next ten days there were two mild attacks. After this the boy slept throughout the night. There was no relapse for eighteen months.

Such cases as the foregoing are unusual. Indulgences in unusual articles of diet cause many attacks which may be compared to nightmare in the adult. When repeated attacks occur, it will usually be found that the child is suffering from persistent intestinal indigestion, or that the evening meal is, as a rule, beyond the patient's digestive capacity.

Illustrative Case.—A boy patient who was four years of age when he came under my care had, during the next five years, two attacks of night-terrors each year. One attack occurred on the night of his birthday and the other on Christmas night. At those times, in spite of my repeated warnings and the repeated attacks, he was indulged in unsuitable articles of food.

Overwork at school and anxiety regarding school duties and lessons have been factors contributing to night-terrors. Contributing factors also are adenoids, enlarged tonsils, and worms.

Treatment.—If the patient is a school-child and the case is aggra-

vated, school should be temporarily discontinued and all exciting play and books of an exciting nature forbidden. The heaviest meal should be taken at midday. The evening meal should consist of cereals, milk, stale bread and butter, and stewed fruits. The child should never be allowed to go to bed unless an evacuation of the bowels has taken place during the previous twenty-four hours.

In the very nervous and irritable cases, from 5 to 10 grains of bromid of soda may be given at bedtime. This should not be continued longer than a week. If the child is delicate, anemic, or suffering from adenoids, enlarged tonsils, or thread-worms, these conditions, any one of which may contribute to night-terrors, should receive proper treatment.

GYROSPASM (SPASMUS NUTANS)

Gyrospasm is a functional nervous affection usually seen in children under one year of age. I have seen but one patient over one year old.

Etiology.—I have seen a considerable number of these patients, and all have been children suffering from malnutrition. Rachitis is always present. Two of my patients were mentally defective.

Symptoms.—The disorder consists of a rhythmic rotatory movement of the head, at times from 20 to 40 oscillations being made in a minute. The movement may not only be lateral, but vertical, which constitutes what is known as head-nodding. In one of my patients both the lateral and vertical movements took place.

The oscillations are usually, but not invariably, associated with nystagmus. The movements of the head occur only when the child is erect, and the oscillations with the nystagmus are increased when the child's attention is focused on some object.

Prognosis.—The prognosis is good if the child is mentally normal. None of these children die of this disease, and practically no cases are seen after the eighteenth month. With improvement in the physical condition and development of the nervous system, the motions cease and occur only under excitement. The disorder is essentially chronic, and the improvement is slow. The mother becomes dissatisfied with the treatment, and wanders from clinic to clinic. This explains in part the large number of cases seen by pediatrists.

Treatment.—The only treatment of value is along nutritional lines. I have had the opportunity to give a few cases a fair trial with sodium bromid in doses from 12 to 18 grains daily, a treatment which is generally advocated for this condition, but have failed to note any special benefit from the method. With an increase in age and improvement in nutrition the cases which I have been able to follow have slowly improved and recovered.

HYSTERIA

Hysteria is a functional disorder, rare in young children, and characterized by nervous crises. My youngest patient was 3½ years old when first seen by me, but the hysteric manifestation had been present for several months. Mental, motor, or sensory manifestations

may predominate in an individual case, although in all cases the condition is associated more or less directly with an absence of mental control. Girls are more frequently affected than boys, but some of the most typical cases coming under my observation have been among the latter.

Etiology.—We are taught by neurologists that hysteria is almost invariably of hereditary origin because of its apparent direct transmission from parent to child. It must be remembered that the child, in addition to being born of an hysteric mother, is in constant association with her. To my mind, in hysteria we have exemplified in the most perfect degree the effect of environment. A neurotic, hysteric mother puts the whole family in a state of high nervous tension. I know of several such instances. A neurotic, irritable father will make the whole family neurotic. I know of such instances also. Fortunately for the offspring, both conditions are seldom combined in one family. When they are (and I have the children of a few such families under my care), the future of the children is discouraging. When one of the parents is sufficiently normal to offset a reasonable degree of neurosis on the part of the other, a stable equilibrium may be maintained.

Imitation is one of the strongest characteristics of the growing child. How often, when arranging with the mother a diet-list for one of these nervous, ill-conditioned children, have I heard the child say that he "hated" cereals, or "hated" vegetables, or "hated" eggs or fowl; or that he "adored" some other article of food, this adoration and hatred, particularly the latter, often influencing the entire future of the child; for without a properly regulated diet for every day in the year only an inferior type of adult can be the outcome. In such cases it will usually be found that the likes and dislikes of the child are identical with those of the parents, whose preference has often been expressed in the presence of the child. "Heredity" here furnishes to the parents a satisfactory explanation of the child's limitations in diet. It will usually be found that parents who live normally have children who eat normally.

Illnesses and ailments of different kinds should not be discussed before nervous and impressionable children. Time and again an investigation of a peculiar pain in a child's head, side, or back which cannot be accounted for by the physical examination will be explained by a similar pain in some older member of the family.

Illustrative Cases.—In one family I have seen three generations of genuine hysteria. In the first generation the father, chronically irritable and neurotic, was a business man with large interests, rarely ceasing, when at home, to talk about his ailments and their remedies; and the mother had marked hysteria, indulging in frequent attacks, with apparent unconsciousness lasting for hours. The daughter, brought up in this atmosphere, through heredity and environment soon became markedly hysteric. When some dispute arose in the family, which was not an infrequent occurrence, both she and the mother would have simultaneous attacks of hysteria. In due time the daughter married and gave birth to a daughter, who promises to maintain the family traditions, with certain additions of her own.

A girl seven years of age lived in deadly fear of appendicitis and developed an

attack of hysteria every time she had a pain. She could locate "McBurney's point," and knew the various stages in the development of the disease and the steps in the operation for appendicitis. The mother's appendix, suitably preserved, is among the family relics, whence it cannot be removed. The influence of heredity perhaps had the effect of making the child alert, precocious, and impressionable. Such favorable soil and the constant association with the hysteric will almost surely develop hysteria in a child.

Symptoms.—Three forms of hysteria may be seen—the mental, motor, and sensory types. An individual may show one, two, or all of the types.

Hysteric patients will be found who have indulged in "tantrums" from very early life. They enjoy their seizures, which are usually manifested by laughing and crying violently in alternation; and not only do they enjoy the indulgence in an attack, but the attention they receive. They are usually obstinate, and do not attempt to exert what mental control they may possess. They may become most violent. Upon attempting to quiet a strong girl of ten years in a violent seizure of hysteric mania I came out a victor, but required the use of plaster bandages as well as the service of a tailor before I could continue the work of the day.

Illustrative Case.—The Motor Type.—A girl thirteen years of age had not been able to walk for three weeks; she was most calm and collected. Examination showed her muscle and nerve condition to be normal. There was no hyperesthesia nor anesthesia, and the muscles of the legs and back were entirely under her control when she was in bed. As soon as she attempted to walk the legs gave way and she sank to the floor. About one year before she had passed through a period when the left arm could not be used for three weeks. She was very fond of looking out of the window. She soon could walk in the direction of the window, but would fail utterly when walking in any other direction. Likewise she could stand by the window and in front of the mirror, —she was decidedly handsome,—but in other situations the legs would not support the body.

The *convulsive cases* exhibit every variety of contortion. The patients throw themselves about in apparent unconsciousness, without regard, yet it will be remarked that they always manage to fall in a soft place. Hysteric patients never injure themselves to any extent. If they pull their hair, they do not pull very hard. They pull another person's hair much harder than their own.

Illustrative Case.—A girl of eleven upon little or no provocation would pass into a trance-like state and remain in this condition for five or six hours until she became very hungry or thirsty. During the attack it was impossible to arouse her by any ordinary means. On one occasion I cried "Fire! Fire!" in an adjoining room. This promptly brought her to her feet. Later attempts along this line were without effect. I instructed that no attention be paid to her when in the attack. The attacks then ceased to be interesting to her and terminated.

Globus hystericus, hiccup, and inability to speak all have been encountered from time to time.

Illustrative Case.—A girl of eight developed an incessant cough, which drove the members of the family to distraction, but was easily controlled through suggestion.

That imitation is a factor of much importance is shown by the dancing mania of former days, and more recently by the school epidemics, necessitating the closing of the school.

Illustrative Case.—In a country school a new girl had habit chorea. Two of the larger boys amused themselves imitating her. Other small boys and girls imitated the boys, and soon the whole group of 30 children were grimacing to such an extent that a temporary closure of the school was necessary.

Hyperesthesia and anesthesia are not common.

The Sensory Type.—This manifestation in children is also quite unusual. Hysteric anorexia or hysteric vomiting has occurred in a few instances. In hysteric anorexia the patient may be unable to eat in the presence of a certain person, or exhibit inability to eat in a certain room or locality, or be able to eat only with certain utensils or in a favorite room or locality, or with the body in a special position.

Illustrative Case.—A girl three years of age was brought to me for treatment because she vomited at the table, over the table, and over any one who was sufficiently near. Not every meal was lost, and food given between meals was retained. There was sufficient disturbance of nutrition to warrant anxiety on the part of the mother. I found the child pale, thin, undersized, and showing a moderate secondary anemia. From infancy there had been some gastro-intestinal disturbance, and the child had been the source of much anxiety to the mother in this regard. For about a year the vomiting at the table had been very distressing. The child had been treated in various ways for stomach disorders or disease, without any improvement whatsoever. After a thorough examination and review of the case I made the diagnosis of hysteria, and directed that the mother, who had neurotic tendencies, should keep apart from the child as much as possible. The child was not allowed to dine with the mother, but was permitted to dine in the kitchen with the maid of all work. The vomiting stopped at once. After about ten days of dining in the kitchen, during which the patient showed marked physical improvement, the maid was called away on account of illness; the child returned to the family table, and again promptly vomited once or twice a day at about the completion of the meal. In three days the maid returned and the child took up dining in the kitchen, with the former satisfactory results. This continued for a few weeks; then there was a disagreement between mistress and maid, and the maid left, never to return. Again the child was placed at the family table, and again the vomiting recurred. Whether the child ate with the family or dined alone, the presence of the mother was sufficient to produce the vomiting. Accordingly, after many terrible trials and many failures, the mother, thoroughly distracted, placed the child in the family of nearby relations, where there were other children. Here she retained her food and throve.

I have treated other vomiting cases of similar nature, but none so obstinate.

Diagnosis.—The diagnosis of hysteria is made chiefly by exclusion of symptoms referable to organic disease of any nature. Electric tests and other forms of examination will establish the non-pathologic character of the illness.

Duration.—There is a marked tendency to relapse. Patients who continue to live under the original neuropathic environment usually continue to enjoy their hysteria. Duration and prognosis depend upon the opportunity for right management and coöperation on the part of the family and friends.

Treatment.—*General.*—My results with hysteric children have usually been very good or very poor, depending to a great extent upon my ability to separate the child from the family. By this statement the proper management of hysteric children is indicated. The child should, if possible, be removed from the unfavorable family influence. The boarding-school has effectually cured several of my cases. Here the child is placed under the care of trained teachers, who bring out the

good and correct the bad by reason, precept, and example, and thus exert a continuous beneficial influence. In the boarding-school, plain diet, pleasant occupation, agreeable association, and a scientifically regulated life replace the spoiling and coddling, and often the unsuitable food, together with the endless nagging which the neurotic mother is very apt to indulge in, with the best intentions, of course, but nevertheless with a most unfortunate effect upon the child. If the child is too young for a boarding-school, or if admission is denied him, he should be placed under the care of some kindly, well-balanced woman as companion and instructor, and see as little of his family as possible; otherwise but little can be expected from the treatment. Of course, the conditions must be explained fully to the parents, in order that they may make an effort to regulate their bearing toward the child in the right direction. If the former intimate associations with the child continue, the good intentions, according to my observation, may prove effective only a very few days. It is impossible to reform the habits of life of a neurotic adult. Once hysteric always hysteric does not come far from the truth. If an individual has grown that way, that way he will remain. The only hope for the child is in his complete removal from such unfavorable influences.

Physical and Mental Activity.—The further treatment of hysteric children consists in curtailing the mental and physical activities, which almost invariably have been excessive. A rational scheme of living should be formulated. "Showing off" the child to visitors and others should be forbidden. If the patient is under ten years of age, he should retire at 7 o'clock every night, and rise at 7 every morning. It is to be understood by the attendant that this does not mean 6.45 or 7.15. Every day after the midday feeding the child should rest quietly in a darkened room for an hour or two. Whether he sleeps or not, he should rest in a recumbent position with clothing removed. For such children exciting games of stress and competition of every nature are forbidden. An outdoor life is to be encouraged. A bicycle, a pony, an individual play-room in winter, and a tent on the lawn in summer, should be provided when possible. School instruction may be given, but the child is not to be crowded. The amount of study and school work depends, of course, upon the child's condition. Until the tenth year, however, there should be but one session (and that in the morning) of one and one-half to three hours. The child should be given a tub-bath or brine bath daily at 90° F. (p. 750). At the completion of the bath he should stand with his feet in warm water and be given a cool douche at 70° to 60° F., the spray tube being attached to a faucet. Cold water may be poured down the spine. This application of cold water should be for a few seconds only and should be followed by brisk rubbing with a rough towel, which should result in a decided skin reaction.

Treatment During Hysteric Seizure.—During a hysteric seizure the child should be treated with kindness, but with firmness. No sympathy should be shown. The application of ice-water to the face and chest

is usually sufficient to break up an attack. In some cases a certain amount of time appears to be required for a return to the normal.

Drugs.—Sedative drugs, such as the bromids, should not be used. Cases have come under my observation showing the bromid rash. Such treatment, as also the use of the opium derivatives, cannot be too strongly condemned. Drugs that increase the appetite and improve nutrition should be given. I have found that iron and arsenic answer well in these cases, as most of the patients show a secondary anemia. For a child from five to ten years of age the following prescription has been useful:

℞ Liquoris potassii arsenitis.....gtt. xc
Extracti ferri pomati.....gr. x
Quininæ bisulphatis.....gr. lx
M. div. et ft. capsulæ no. xxx.
Sig.—Take one after each meal.

If constipation results from the use of the small doses of iron, ⅓ to ½ grain of the extract of cascara may be added to each capsule. If the child cannot swallow a capsule, the following may be used:

℞ Liquoris potassi arsenitis.....gtt. lxxii
Ferri et ammoniæ citratis.....gr. xxiv
Elix. simplicis..... ℥ss
Aquæ.....q. s. ad ℥iv
M. Sig.—One teaspoonful after each meal in a glass of water.

The iron and arsenic may advantageously be alternated with pure cod-liver oil,—one to two drams after meals,—each medicine in turn being given for seven successive days. Alcohol should form no part of the medication of these children. In using the so-called liquid proprietary foods, it is to be remembered that some contain a considerable percentage of alcohol.

HABITS

Children readily acquire habits, good or bad. Under the management of an intelligent attendant, directed by the physician, natural tendencies toward the repetition of an act may be turned to the child's inestimable advantage. In earliest infancy the habit of taking the nourishment at definite periods should be established, and as the child increases in age, proper habits of sleep and rest must also be acquired. The child should be bathed at a stated time and aired at a stated time each day, and, in general, in order to fulfil the requirements of vigorous animal life, his life should conform to a routine in which there is but little variation. As our sole object is the production of a normal adult, only those habits tending toward proper growth and development should be encouraged. The habit of self-entertainment is important. An infant who requires to be constantly in arms when awake will have a tired attendant, and usually will develop into a tired and irritable child.

Bad Habits and Their Correction.—Among the bad habits early acquired and difficult to break is that of *thumb-sucking* or *finger-sucking* and the *use of the "pacifier."* The penalty paid by these children for

such indulgence is thickened, boggy lips, due to hypertrophy of the orbicularis oris muscle and adjacent structures. Persistent sucking also produces a forward projection of the upper incisor teeth and an angular deformity of the upper jaw. The correction of the rubber-nipple and pacifier habit is readily accomplished by the immediate withdrawal of these articles. The child will experience several fretful days and make association temporarily unpleasant for those about him. The thumb-sucking habit may be corrected by having the child wear a mitten or glove made of muslin or old linen which is shirred and tied at the wrists. The Hand-I-Hold Mit (Fig. 59) answers the purpose of preventing thumb- and finger-sucking better than any other article. The child has full use of his arms, yet the hands contained in the aluminum mit are free from manipulation. Applying bitter drugs to the fingers or thumb may be effective in controlling the habit. The tincture of aloes or a solution of bisulphate of quinin, one dram to two ounces of water, is generally used. The fingers should be repeatedly moistened with the solution. Mothers will sometimes tell us with considerable amusement that the application of the bitter drug to the finger makes no difference to the child; he appears to like the taste of quinin or aloes. The child, however, soon tires of the bitter taste, and continued use of the remedy will always stop the habit. Biting the finger-nails may likewise be remedied by the use of these bitter solutions.

Picking or *rubbing the finger-tips* with the fingers of the opposite hand is rather an unusual habit. It may cause considerable hypertrophy of the ends of the fingers, so that they will acquire an appearance not unlike that occasioned in cardiac disease. Mechanical restraint is our best preventive. The constant use of gloves or the application of strips of adhesive plaster will break the habit.

Head-banging is, fortunately, an unusual habit. It consists in repeatedly elevating and bringing the head forcibly down on the mattress when asleep. This I have seen done in one instance with sufficient force to produce vibrations in the other rooms of the house and interfere with the repose of the occupants. Every means and device for preventing the banging was tried without effect. Finally the patient became such a nuisance to his family that he was made to sleep in a hammock. This, to the best of my knowledge, was the means of curing the condition.

It is surprising in how many ways children develop habits of *manipulating different parts of the body.*

Illustrative Cases.—One of my most troublesome cases was that of a child one year old who came to me with an ear stretched to twice its normal size. During the greater part of the waking hours the child grasped and pulled at the top of the left ear.

Another patient was brought because of the habit of burrowing the right thumb into the right nostril. The nostril had become stretched to at least three times its normal size, causing a most peculiar deformity.

An eight-year-old girl developed the habit of striking her left leg at the calf with the heel of her right shoe when walking. Her stockings soon became worn and soiled, and the child presented a ridiculous appearance in public. In running or in going up and down stairs the habit was not practised. The girl was brought to me because of the peculiar habit, which had been kept up for several months. She had received

the usual punishments and rewards without effect. Upon discovering that she only practised the leg-banging when walking, I advised a treatment which proved effective. This consisted in not allowing the child to walk for six months. She was made to run or walk rapidly whenever walking was necessary.

A girl six years old, without eczema or any evidence of irritation, came to me because of the habit of rubbing the right thigh. While walking a city block she would raise the clothing with the right hand and rub the outer lower third of the thigh for a second. This act, according to the mother, would be repeated a hundred times a day if there was no interference. The treatment suggested in this case was simple and effective. Several thicknesses of a roller bandage were used in covering up the favorite skin area. Whatever gratification was experienced by the manipulation was thus done away with, and the habit was promptly broken. The parts were kept bandaged for three months.

The most pernicious habit, that of *masturbation*, is referred to below.

It is impossible to make more than general suggestions for the correction of bad habits in children. When there is manipulation of the mouth, the sense of taste can usually be made to aid us. In other instances restrictions of a mechanical nature may be necessary. In the ear-pulling case, a tight-fitting muslin cap was worn constantly and the right hand kept pinned to the clothing. Punishment, rewards, and ridicule all may be employed in the treatment of these cases. As a rule, however, such measures are not as effective as mechanical restraint. Bad habits as to hours for feeding and sleeping, as well as the habit of carrying a child in arms—all may be corrected by doing the right thing at the right time and having a sufficient amount of courage to persist. It is to be remembered that, regardless of age, a child is never harmed by rigid discipline properly applied.

MASTURBATION

Before the fifth year a great many more cases of masturbation are seen among girls than among boys. After that age it is more frequent in boys. The most common means of practising masturbation in either sex in infancy is by leg-rubbing. Contact by means of the edge of a chair or the corner of a sofa or any object against which pressure may be exerted is not infrequently the means used by older girls. Manipulation of the parts, while only occasionally seen in girls, is the usual method of boys after the third year. My youngest patient was a female child six months of age who was a "leg-rubber," and who evidently passed through a complete orgasm. In many the habit will be indulged in several times a day.

In boys the primary causes of the practice are an elongated foreskin, adherent prepuce, and phimosis. The handling of the parts necessary to keep the uncircumcised clean is an exciting factor. In girls, vulvitis and vaginitis, and adhesions of the clitoris with the retained smegma and resulting irritation, are frequent causes. It is a popular notion that thread-worms may be an exciting factor, but among many cases of masturbation and many cases of thread-worms I have never seen both conditions in the same child.

Prophylaxis.—Masturbation is much easier to prevent than cure. In boys, prevention lies in keeping a clean, free glans, which in the

great majority of male infants can be obtained only after proper surgical procedures. The elongated, thickened, uncut portion of the foreskin usually seen below the glans after a ritual circumcision is but little better than a free, elongated prepuce. Slitting of the foreskin on the dorsum gives a condition very similar in character to that of a long, redundant foreskin. In girls, prevention to a certain degree consists in keeping the parts clean through washing them once a day with great gentleness, and the free use of non-irritating absorbent powders. A powder composed of equal parts of powdered starch and oxid of zinc gives very satisfactory results.

Treatment.—When the habit of masturbation has been once established, the first step is to eliminate the cause, if it can be discovered, and put the parts in a normal condition. Circumcision in boys, and releasing the adhesions of the clitoris in girls, with the maintenance of cleanliness and as little manipulation as possible, are absolutely essential.

The urine should be examined, and if found highly acid, should be corrected by diet and by the use of bicarbonate of soda, six to twelve

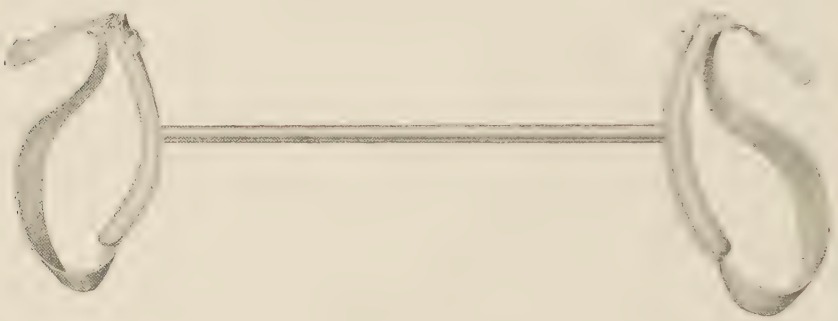


Fig. 57.—Knee-crutch.*

grains being given daily, according to the age of the patient. If red meat has formed a considerable part of the diet, the quantity should be reduced and given not oftener than three times a week.

Having removed all possible sources of local irritation, we are in a position to use restrictive measures, as it is through such treatment only that a cure will finally be effected. If the practice is prevented the habit will soon be forgotten. The older the child, the more difficult will be the cure. The restrictive measures employed depend to a considerable extent upon the age, sex, and method of practice. In the case of young children of both sexes who practise leg-rubbing, a large napkin of some coarse material, or a towel, should be placed over the napkin usually worn, and applied in the same way, so as to keep the legs widely separated. After the napkin age a large towel may be used, if necessary, for the same purpose, or the knee-crutch (Fig. 57) may be employed. Some children will indulge only when in a certain chair or in a certain position.

* Made for the author by George Ermold Co., 201 East 23d St., New York City.

Illustrative Cases.—A very troublesome case in a girl seventeen months old was treated without success for several weeks, when I discovered that the child practised the act only when in her high chair, as by leaning forward and grasping the projecting arms she managed to bring the necessary pressure to bear upon the genitals. The use of the chair was discontinued, and there was no further trouble.

Another girl six years of age was an inveterate masturbator. She had been treated by several physicians. The act was repeated daily, sometimes two or three times a day, usually by contact, such as by pressure against the corner of a table, sofa, or chair. When in bed, she indulged in the practice by manipulation. She had become pale, thin, and hysterical, and as she was a member of a prominent family, great concern was felt for her. The external genitals were congested and swollen as a result of the direct irritation, otherwise they were normal. It seemed that here was a case where eternal vigilance was the price of safety. The gravity of the condition was apparent, and the parents readily agreed to my suggestion that the

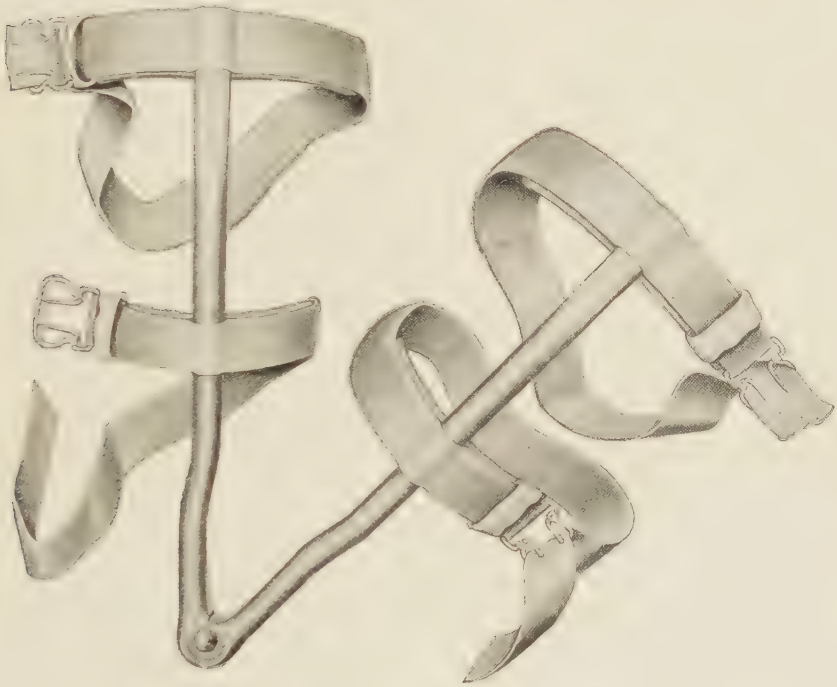


Fig. 58.—Brace used to prevent manual masturbation.*

child should never be left alone. The mother and the nursery maid took turns in being with the child in the daytime. A trusty middle-aged woman was selected for the night watch. I directed that no reference be made to the habit, but that the child should be severely punished if the practice was attempted. This, however, was not needed. This child, as is the case with all older children, masturbated in secret, and as she was never left alone, stopped the practice. She was given suitable food, teaching by a visiting governess was begun, and hard play was soon advised, as her physical improvement was rapid. As there was no further tendency to masturbate, the night watch was withheld after six months. The child was kept under the closest observation, however, for a much longer time. Coöperation to such a degree as in this family may, however, rarely be secured.

Older children who practise manipulation of the parts can usually be watched during the daytime, but the habit is frequently indulged in

*Made for the author by George Ermold Co., 201 East 23d St., New York City.

on going to bed, after the lights are out, and in the early morning, particularly when prevented during the day. In such instances I have been obliged to advise mechanical restraint. An inexpensive and effective means is a piece of tape, which is tied in the center around the child's neck in a flat knot, leaving the two ends long enough to be securely tied around the wrists, so as to allow a free movement of the hands above the umbilicus. The child can use the handkerchief, and adjust the bed-clothing, but cannot touch the genitals. If the patient is a girl and a masturbator by contact with any object, or a leg-rubber, a large bath-towel, if worn like an infant's napkin, will aid materially in discouraging the practice. A brace (Fig. 58), constructed of steel, with a hinge-joint to allow the arm to be extended to an angle of about 45 degrees, has been used with success in a few cases. This brace is worn only at night.

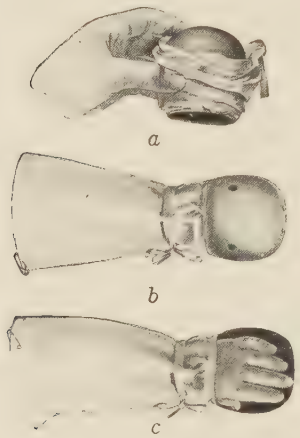


Fig. 59.—The Hand-I-Hold Babe Mit and method of applying: *a*, First, roll sleeve over ball to expose opening, then insert the child's hand; *b*, second, tie tape at wrist and pin with safety-pin to dress at elbow. If mit is not held in place firmly enough, use a broad piece of cheese-cloth in place of tape. Bind this firmly around the wrist and tie; *c*, *x*-ray view showing freedom of hand.

The "Hand-I-Hold Mit."*—As a means for the prevention of scratching, thumb- and finger-sucking, nose-boring, ear- and lip-pulling, and masturbation, the "Hand-I-Hold Mit" renders good service. The child has free use of the arms and the fingers are movable inside the mit. In eczema, however, it may serve as a very attractive means of rubbing the diseased surfaces.

HICCUP

Hiccup is a spasm of the diaphragm, usually due to gastric irritation from the distention of the stomach or intestine with gas, or overloading of the stomach with food. Under such conditions the spasm is usually of little consequence, and may readily be relieved, if the attack is prolonged, by an enema of soap-water and a laxative dose of rhubarb and soda. With any grave illness, however, it is a symptom of serious import. Hysteric girls often have hiccup to quite an alarming degree. The attack usually follows a period of unusual excitement. In these cases from 20 to 30 grains of bromid of soda repeated in from twenty to thirty minutes will usually control the spasm.

INFANTILE CONVULSIONS

A convulsion consists of a temporary loss of consciousness, associated with rhythmic clonic contractions of various muscles of the body. We are dealing with a symptom, and not with a disease.

* Manufactured by R. M. Clark and Co., 246 Summer Street, Boston, Mass.

During the early days of life a convulsion is always of serious import, as it frequently is the result of a birth trauma and suggests a serious brain lesion which may terminate in early death or result in spastic paralysis, or idiocy, or both.

Etiology.—Infants and young children are peculiarly susceptible to convulsions because of lack of inhibitory control, due to insufficient development of the motor centers in the cortex, which, in consequence, discharge the more readily. A convulsion may be looked upon as a motor discharge affecting either the entire muscle structure or only a portion thereof. Convulsions, therefore, indicate cortical irritation. The irritation may be due to injury of the brain structure, as previously mentioned, birth trauma being the usual cause of convulsions in the very young, or the convulsion may be the result of irritation from meningitis, tumors, hydrocephalus, or trauma in later life, such as a fall or blow on the head.

Illustrative Case.—An infant of eleven months fell from his baby carriage to the stone pavement. Convulsions, repeated and severe, continued until the bleeding area in the cortex was located, the skull was opened, and the bleeding vessel was tied.

Convulsions may be due to remote causes.

Rachitis.—Rachitis, according to my observation, is a most fertile contributing cause. The reason for this is not clearly understood. Various theories have been advanced. Probably the nerve-centers share with other portions of the body in malnutrition and lack of development. In a rachitic the inhibitory control is of a very low order. In many rachitic children it is surprising how little irritation may bring on a seizure.

Gastro-intestinal Causes.—An immense majority—over 90 per cent.—of the cases of convulsions coming under my notice have been due to gastro-intestinal disorder, most frequently in the form of acute indigestion due to unsuitable articles of diet. Rachitic children supplied many of these cases.

If the irritation is sufficiently severe, convulsions may occur in the most robust. Thus, a boy of three years had repeated convulsions until he was relieved of 43 large round-worms (lumbricoids).

Convulsions of intestinal origin may be due either to the effects of toxins supplied by abnormal digestive processes, or to direct intestinal irritation. A case of the latter type was seen in the New York Infant Asylum, where a child had repeated convulsions and died in a seizure. At the autopsy a fourth of a small orange was found in the intestine.

Thymus Gland.—Enlargement of this gland has been present in six cases of fatal convulsions. The majority of the cases have been seen in hospital work, where the enlargement of the thymus could be proved at autopsy.

I have seen in private work two fatal cases presenting the same symptoms.

Convulsions of toxic origin may usher in pneumonia, scarlet fever, or any of the acute infectious diseases.

Uremic convulsions are to be classed under this heading.

Convulsions are frequently the termination of a prolonged bronchopneumonia or enterocolitis. I have seen a large number of these cases in institution work.

Heredity apparently plays but little part as regards predisposition.

Dentition.—Dentition may indirectly be a cause in producing indigestion, with resulting irritation and toxemia. I have had three patients who had convulsions with every tooth cut and without demonstrable associated digestive disorder.

Phimosis.—Two boys had repeated convulsions which subsided when they were circumcised and relieved of much smegma and local irritation.

Asphyxia.—A strong boy nine months of age was taken in bathing by his mother. A large wave enveloped and separated them. The baby was unconscious when found. With returning consciousness he passed into a convulsive state which lasted several hours. Evidently there was a cerebral hemorrhage, as the child is now an imbecile and had been perfectly normal before.

Repetition.—With each convulsion the inhibitory control is lessened, and each succeeding seizure requires less cortical irritation than its predecessor. Gowers states that 30 per cent. of the cases of epilepsy have their origin in so-called simple infantile convulsions.

Manifestations.—Convulsions vary greatly in their manifestations. The seizure may be so slight as to be scarcely recognized. These are the so-called "inward" convulsions. There may be a momentary spasm of the body, with slight twitching of the face and extremities, after which the child appears normal or sleepy and dull for a few moments. The convulsion, on the other hand, may be most intense and prolonged. The onset is sudden. There are usually twitching of the muscles of the face and incoördinate movements of the extremities. There are alternate contractions and relaxations of all the muscles. The eyes become set, and the child is unconscious. There is frothing at the mouth, and the breathing is stertorous and labored. The child may rapidly pass out of the convulsive state or become quiet, with infrequent twitchings, and thus remain for hours. In a fatal case the temperature was 111°F.—as high as my thermometer would register. The temperature was reduced, and the child lived eight hours, but never regained consciousness.

In many instances the child passes from one convulsion into another. During active treatment, such as the hot bath and chloroform administration, the seizure will apparently cease, and the child will show signs of returning consciousness. As soon as the treatment is discontinued the convulsion is again repeated.

Prognosis.—I have seen a considerable number of cases of fatal convulsions, and do not look upon any attack with unconcern. The prognosis depends entirely upon the general condition of the patient and the direct cause of the convulsion. In the convulsions of scarlet fever, pneumonia, and gastro-enteric disease there is usually but little

danger to life. If the attack is due to an enlarged thymus, the prognosis is unfavorable.

A convulsion may be serious in its immediate, as well as in its remote, effects. One convulsion may produce cerebral hemorrhage, which may change the entire future of the patient, producing spastic paralysis or idiocy or both. About 10 per cent. of the cases of epilepsy originate in indigestion—the so-called "dentition convulsions." In these rachitis plays an important etiologic part.

Under my observation several children under one year of age, in apparently good health, have died as the result of convulsions. In one case we found, upon autopsy, as above noted, one-fourth of an orange in the small intestine. In six the convulsions were due to enlarged thymus glands. In three of these cases there had been no previous symptoms indicating the existence of this condition. The patients were strong, robust infants. Two were breast-fed. The diagnosis was confirmed by autopsy in four cases, which included the breast-fed.

Treatment.—*Immediate Treatment.*—When a convulsion occurs, the patient should at once be undressed and placed in a mustard bath (p. 750), at a temperature of 105° F. While in the bath, he should receive brisk friction of the trunk, and particularly of the extremities. At the same time an attendant may give an injection of soap-water. In a great majority of the cases, in less than five minutes the child will show evidence of a return to consciousness. As soon as he can swallow, two teaspoonfuls of castor oil should be given.

After a seizure the patient should be kept very quiet for twenty-four to forty-eight hours. An ice-bag or cold cloths should be applied to the head, and a guarded hot-water bottle kept at the feet.

Diet.—The diet should be the lightest. Chicken broth, weak beef-tea, and thin gruels should constitute the nourishment for a day or two. A second seizure is more easily produced than the first, and a third easier than the second.

The Use of Chloroform and Sedatives.—In case the attack is a very severe one, when the child is slow to respond or when he passes rapidly from one convulsion to another, chloroform inhalations, regardless of the age, should be given in sufficient quantity to prevent the seizures until the intestinal canal can be emptied, and sufficient sodium bromid and chloral can be given by mouth or rectum to prevent a recurrence.

Rectal Medication.—To a child under one year of age 8 grains of sodium bromid and 3 grains of chloral may be given by rectum in 2 ounces of mucilage of acacia. After the first year, from 3 to 5 grains of chloral may be given with 10 to 20 grains of sodium bromid. It is best to attach to the syringe a soft-rubber catheter, No. 18 American, or a small rectal tube. The catheter should be introduced for at least 9 inches, so that the solution may be carried to the descending colon, where it will be retained better than if introduced with the small hard-rubber tip just within the anus. The bromid and chloral may be

repeated at intervals of two to six hours, as required to control the convulsions, and continued in diminished doses as long as there are noticeable signs of nervous irritability, such as twitching and involuntary muscular contractions.

Sedatives Internally Administered.—If the child can swallow, 5 grains of sodium bromid in $\frac{1}{2}$ ounce of water may be given, and repeated at intervals of one to four hours, until the convulsions are controlled.

Hypodermic Medication.—Morphin hypodermically is rarely required. It should be used only when other means fail. A child one year of age may be given $\frac{1}{30}$ grain, and this may be repeated in two hours, though usually it will not be required. Under one year, $\frac{1}{50}$ to $\frac{1}{40}$ grain may be given; under six months, morphin should be omitted.

LARYNGISMUS STRIDULUS

In laryngismus there is a spasm of the larynx involving the muscles of both inspiration and expiration. This rarely occurs after the eighteenth month. I have seen it but a few times in older children.

Etiology.—Laryngismus, according to my observation, occurs with few exceptions in weakly children—those suffering from malnutrition and rachitis. I have seen the condition in a small number of children otherwise perfectly healthy who presented no explanation for the peculiarity. The presence of adenoids or any source of irritation of the upper respiratory tract increases the severity of the spasm and the number of the attacks. Enlargement of the thymus gland is a possibility as a causative factor in any case. I have seen two fatal cases in which the enlarged thymus was unquestionably the cause of death. Two patients under treatment at the time of writing, aged eleven months and seven months respectively, show absolutely no abnormality. They are strong, well-nourished children. One of these children has had one general convulsion following the attack. Such an occurrence is most unusual.

In all cases of laryngismus there is a peculiar lack of inhibitory control, due to a lack of development of the controlling nerve-centers. We see every condition that is recorded as causing laryngismus, in children who never show these symptoms.

Morbid Anatomy.—No definite lesion has been found to account for the spasm, which occurs in association with a wide variety of morbid states, as well as without any apparent pathologic condition.

Symptomatology.—The attacks are usually excited by some disturbance of the child's mental state. Thus, crying ushers in most of the paroxysms. The child attempts to draw in the breath preparatory to the cry, and the laryngeal spasm begins. There may be several short, whistling inspirations, each attempt being less successful than the first. The whole procedure requires but a few seconds. The face is first red, then blue and cyanosed. The absence of respiration continues for an indefinite time—usually but a few seconds. Then the spasm subsides, and the child "catches" his breath, which is signaled by a short inspiratory crow, followed by a series of longer and more successful

noisy inspirations. The child cries, the blood becomes oxygenated, the normal color returns, and all is well until the next attack.

A patient three months of age had from twenty to thirty seizures a day, and the attacks ceased only with an improvement in the child's general condition.

The attacks may be milder or more severe than the foregoing. In the mild cases complete apnea does not take place. In others the laryngeal spasm is complete from the onset. The child attempts to cry, and falls into what the mother calls "a faint," becoming thoroughly relaxed and unconscious. Such attacks as these always cause me much anxiety, as they suggest strongly the possibility of enlarged thymus and sudden death. The period of unconsciousness may persist for a variable time, ranging from a few seconds to a minute or two.

Diagnosis.—The diagnosis is made by the sudden onset of difficult breathing, the rapid return to normal breathing, and the continuation of normal, unimpeded breathing between the attacks. In susceptible subjects the laryngismus may occur with whooping-cough and with acute catarrhal laryngitis. These diseases have a distinct symptomatology of their own, and need cause no confusion.

Prognosis.—The prognosis in the main is good, but when one has seen sudden death in infants in private families and others in hospital work, all with spasmodic laryngeal association, he does not have the confidence in the outcome of a convulsion that is claimed by many writers who, evidently, have seen but a few cases.

Duration.—Prompt results under treatment, except in mild cases, are the exception. The attacks may continue, varying widely in number, for several weeks.

Treatment.—*Drugs.*—The management is divided into two parts: the immediate relief of the spasm, and the treatment of the patient's debilitated physical condition, if such condition exists. From my observation, the most satisfactory method of relieving spasm in the mild cases—those in which the unconsciousness is of but a few seconds' duration—is by inverting the patient and at the same time slapping him on the back. Splashing cold water in the child's face may be of advantage in some cases, but I have found it of but little service. In cases which are sufficiently prolonged to resist inversion and slapping on the back, a quick resort to alternate hot and cold tub-baths, at 60° F. and 120° F. respectively, has been useful. If recovery is not prompt, intubation or tracheotomy should be performed, followed by attempts at artificial respiration. Between the attacks the patient should receive small doses of antipyrin and sodium bromid. Under six months of age ½ grain of antipyrin and 2 grains of sodium bromid may be administered in 1 dram of cinnamon-water, 6 doses being given in twenty-four hours. From the age of twelve months to the third year, 1 to 2 grains of antipyrin with 2 to 4 grains of sodium bromid may be administered in 1 dram of cinnamon-water, 6 doses being given in twenty-four hours. The only disadvantage in the use of these drugs lies in the fact

that these children may have faulty digestion, which condition may be aggravated by the sodium bromid. When this effect is observed, the bromid should be omitted and the antipyrin given alone. Antipyrin apparently never produces any unfavorable effects upon gastric digestion.

Rectal Medication.—Colon medication may be of considerable service in these cases, and, when indicated, bromid and chloral are our most reliable sedatives. To a child of six months or under, 1 grain of chloral with 5 grains of sodium bromid may be given in 2 ounces of mucilage of acacia by the bowel; to a child of six to twelve months, 2 grains of chloral and 8 grains of sodium bromid in 3 ounces of mucilage of acacia; to a child of twelve to twenty-four months, 2 grains of chloral and 10 grains of sodium bromid may be given in 2 ounces of mucilage of acacia. The bromid and chloral should not be administered oftener than once in six hours.

The method of administration is as follows: A large soft-rubber catheter or a small rectal tube, attached to a Davidson syringe, should be introduced at least 9 inches into the rectum, so as to reach the descending colon. The child should rest on the left side, with the buttocks elevated on a pillow so that they are higher than the shoulders. After the withdrawal of the tube the position of the child should be maintained for several minutes in order to aid in the retention of the fluid.

All sources of reflex irritation should be removed. If difficult dentition is a factor, the troublesome tooth should be brought through the gum. Adenoids, thread-worms, adherent prepuce, and constipation all should receive proper attention. Particularly must these children be kept free from all sources of mental excitement, such as loud talking, the overattention of adults, and the rough, active play of older children.

Diet.—The dietetic management of debilitated, rachitic children suffering from laryngismus is the same as that of other debilitated children. (See Malnutrition, p. 90.) In general, they should be given as high a proteid diet as is compatible with their digestive powers. Thus, if there is intolerance of cow's milk given in suitable dilution, there should be no hesitation in advising the employment of a wet-nurse. The proprietary foods should not be given such children if better means of nourishment are obtainable. For children over one year of age cow's milk, cereals containing a large amount of nitrogen, soft-boiled eggs, beef-juice, and scraped beef should form a large part of the diet.

TETANY

Tetany is a condition characterized by persistent tonic contractions of the muscles, usually of the upper and lower extremities. In rare instances cases will be seen in which the peculiar tonic contraction involves all the muscles of the body.

Age.—Tetany is rarely seen after the second year, though cases are occasionally reported as occurring in older children.

Tetany is most commonly seen in marasmic infants suffering from

intestinal derangements of a not very active type. Occasionally it occurs in well-nourished children.

Etiology.—In the great majority of instances tetany occurs in infants suffering from malnutrition and under one year of age. Rachitis has been present in the majority of my cases. In all cases seen by me malnutrition or pronounced digestive disturbance has been present.

Illustrative Case.—A baby three months of age was given a high fat mixture (7 per cent.) in order to supplement the mother's milk. After a few feedings the child developed convulsions, with the typical tonic contractions. Under treatment the mental condition cleared, but general muscle contractions continued, which evidently caused great pain. The child was absolutely rigid, with both the lower and the upper extremities in the characteristic position, which continued for several days.

The actual cause of this disease is still obscure, but from time to time new light is being thrown upon the subject. The majority of the cases are seen during the winter and early spring months, and, owing to this fact, Kassowitz's theory of a respiratory infection has received strong confirmation. Escherich, Ganghofner, and others have found that manifest tetany and laryngospasm in children increase during the beginning of winter, and gradually reach their highest point in February and March, after which they diminish in frequency until midsummer, when the incidence is practically zero. Escherich's statistical table of 240 cases shows:

Month.....	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Number of cases..	29	51	59	45	10	7	0	1	4	2	21	16

In a recent, rather extensive work, Wilcox, of New York, found that during the months of December, January, and February he obtained the greatest number of middle-grade reactions, while three of his cases of frank tetany occurred in February and two each in December and January. The incidence of hyperirritability was greatest in December. At the Babies Hospital, during the months of January, February, March, and April, five cases of true tetany were observed. These months coincide fairly well with the months in which Escherich found tetany most prevalent.

It appears, from the literature on the subject, that the frequency of tetany varies considerably in different countries and cities; in some localities the cases are almost frequent enough at least to suggest an epidemic. In infancy males seem to be more frequently affected than females.

According to Fischl, fully 63 per cent. are rachitic; this, of course, will vary in different countries. Kassowitz has demonstrated the similar relation to the time of year existing between the incidence of tetany and that of the rachitic affections. He came to the conclusion that there must be an intimate relation between the two. Wilcox concludes that the child's irritability varies directly with the general condition of nutrition, and that the well-developed and nourished respond much less readily to galvanism than those underfed and below the normal weight.

Seligmüller, Pott, Thiemich, and others are convinced that spasmophilia (tetany, laryngospasm, and eclampsia infantum) possesses in a well-marked degree the characteristics of heredity. Thiemich's decision has come from a dozen observations at the Breslau Kinderklinik relating to families in which the mother had laryngospasm or eclampsia in her childhood, and still shows a pronounced facial phenomenon as a residuary latent symptom.

Cold, intestinal parasites, bowel infections, chronic intestinal disturbances (of which there were fully 73 per cent. in Fischl's cases), and an enlarged thymus, have all, in turn, been regarded as causative factors. Concerning the latter theory, which was advanced by Paltauf, one must consider the contrast existing between the pasty "lymphatic" type and the lean and imperfectly developed child, in which the evidences of the spasmophilic diathesis are almost solely found.

It seems improbable that the disturbance has anything to do with the sugar, fat, or protein, since no harm results by adding any of these substances to a diet consisting of carbohydrates, which tend to diminish irritability. On the other hand, whey acts precisely as does cow's milk in increasing both mechanical and electric irritability, and it might be supposed that it contains in solution a substance which is concerned in the production of the symptoms.

Considerable evidence has been accumulated of late concerning calcium metabolism and its relation to tetany. So far the conclusions arrived at by different observers vary, but, nevertheless, there are a few points on which a unanimous opinion exists. Experiments in physiology have shown that the peripheral nerve irritability can be influenced by salt solutions, and only lately have the researches of Holb shown that it is not one salt alone, but the interaction with other salts, which influences nerve irritability; either a diminution of the sodium or an increase of the calcium diminishes irritability. This fact has suggested that the etiology existed in salt metabolism.

Due to these observations, Czerny commenced some experiments on the chemical examination of brains, which were carried out by West, who showed that there was a diminution of the calcium content of the brains of children with tetany; he further pointed out that, by feeding calcium-poor food to dogs, the irritability of the peripheral nerves was diminished, while Sabbatini demonstrated that the application of calcium to the cortex diminished the electric excitability. Stoeltzner, attempting to repeat these observations, obtained somewhat contradictory results. Rosenstern, along with other observers, approached the subject from the clinical aspect and fed calcium salts in cases of the spasmophilic diathesis, producing a remarkable diminution in the nerve irritability, the effect of which disappeared in twenty-four hours, the same results being obtainable, only more rapidly, by the intravenous injection of the calcium salts.

An examination of the blood in this condition has shown a considerable diminution of the salt, while, on the other hand, there is known to exist an increased output of calcium in the urine and feces. Similar

results have been obtained in this country by McCallum and Voegtlin in experiments on parathyroidectomized dogs. Further explanation is offered in postoperative tetany in adults. When the parathyroids have been wholly or partially removed, the symptoms ensuing are relieved by the administration of calcium by mouth, the effect passing off in a few hours. In infantile tetany little result has been obtained by the administration of calcium by mouth.

Pathology.—No constant lesions have been located that may be associated with tetany. Thus far no uniform anatomic changes in the parathyroids have been reported. The most usual findings are hemorrhage, recent or old; cysts, and staining. Fischl, in a somewhat recent article, published the postmortem findings in his fatal cases. He found tuberculous meningitis, bronchopneumonia, hemorrhagic infiltration of the brain, edema, and chronic intestinal inflammation. In one case seen by me there was a pachymeningitis. Autopsies on other infants in whom tetany was present failed to reveal any diseased condition of the nervous system.

Symptoms.—The appearance of a child with tetany is characteristic. The symptoms vary only in their intensity.

In mild cases there may be simply an adduction of the thumb on the palm of the hand, giving rise to the term the "accoucheur hand." With this phenomenon there will usually be an extension of the feet, caused by marked contraction of the tendo Achillis.

Fig. 60.—Hand in tetany.

In the more pronounced cases the hands are flexed on the arms, and the fingers are lightly contracted over the adducted thumb (Fig. 60). The feet are held in a marked extended position, with the toes flexed toward the plantar surface of the foot. With the second and third row of phalanges extended, a similar phenomenon is also sometimes seen in the fingers. Usually the joints at the elbow, shoulder, hip, and knee may be moved without discomfort. Attempts at forcing the other joints to the normal position are met with resistance and evidence of pain. The knee-jerk is markedly exaggerated. There is an increased response to both the galvanic and faradic current. Muscle irritation may or may not cause various phenomena. Trismus has never been present in my cases.

Muscle Irritability.—Evidence of muscle and mechanical irritability may be demonstrated in the following ways:

The *Chvostek sign* depends on the heightened irritability of the facial

plexus (some believe it to be reflex), which, on being tapped with the finger or a percussion-hammer midway between the zygoma and the angle of the mouth, produces a contraction at the ala of the nostril, the angle of the mouth, and, in marked cases, the inner canthus of the eye and eyebrow. This symptom is given various grades of importance by authors. Thiemich's conclusions are that "the facial should be stricken from the list of nervous stigmas, and must be regarded even in late childhood as a pathognomonic sign of latent tetany, even if this disease remains continuously a symptomless anomaly of the nervous system." This sign was found in but one of Wilcox's cases, and it will be found in perhaps half of all cases.

Schultz's sign is produced by stroking the skin over the zygoma, which in extreme cases of tetany produces a contraction similar to the Chvostek. In comparatively few cases can this sign be demonstrated.

Trousseau's Sign.—Shutting off the blood-supply in the elbow or groin, through pressure, is followed, after a varying interval, by the typical carpal or pedal spasm.

Duration.—The condition, under my observation, has lasted from a day or two to two to six weeks. A return to the normal is usually slow. Cases that are entirely relieved in less than a week are extremely rare. When the disease disappears rapidly, we are not sure that it may not return, possibly in a more severe form.

Diagnosis.—The diagnosis is not at all difficult, and is made by the characteristic contraction of the hands and feet, which occurs in no other condition. While perhaps the nervous phenomena might suggest cerebral disease, the absence of mental symptoms excludes it.

Electric Irritability.—In tetany the electric reactions may be said to be of distinct diagnostic value. It seems very difficult to establish exactly normal reactions for children, as many will react low one day and high another, and then again the reactions vary with changes in the digestive and metabolic processes. It must be kept in mind that the electric reactions are not always diagnostic of tetany, but, on the other hand, there is now no doubt that, by this method of diagnosis, cases hitherto not suspected of tetany may be brought to correct diagnosis. Just what exact electric findings are essential to a diagnosis is still a matter of dispute. Escherich believed that in normal children only, KCC appears under 5, and that only occasionally may anodal closure be present with this current strength.

Wilcox cites the grades of electric irritability:

1. Normal, in which KCC occurs under 5. Sometimes ACC is found at 5 or just below it.

2. The middle grade, or anodal hyperirritability, in which KCC is less than 5, and AOC is less than ACC and less than 5.

3. Tetany, in which all four reactions are less than 5. A suggestive tetany is the occurrence of AOC less than ACC and the appearance of KCC tetanus.

The incidence of tetany varies, due presumably to the varying attitudes of the observers as to what constitutes a true diagnosis. Numer-

ous authors give figures varying from 6 per cent. down to 0.7 per cent. in artificially fed children under three years of age.

Technic.—The simplest and most efficient instrument is one supplied by Wappler and Co., of New York. It consists of dry cells which supply a galvanic current and contain a switch for reversing the polarity, a rheostat for controlling the current, and a balanced milliamperemeter measuring from 0.2 to 10 milliamperes.

The patient is laid in bed with the feet directed toward the observer, who grasps the right foot with the left hand, in such a manner as to be able to detect the slightest response occurring in the flexor tendons or the ankle or toes. The negative electrode is placed upon the abdomen of the patient, while the positive one is controlled by the right hand of the operator, who at the same time regulates the rheostat with his elbow. The test should always be begun with a current strength sufficient to produce muscle response and then gradually reduced. If the opposite is attempted, the lowest point will invariably be passed. One should always consider the individual skin resistance, which varies directly with the amount of fat and is rapidly reduced as the test progresses.

Prognosis.—The prognosis depends entirely upon the condition which accounts for the tetany, which is to be looked upon as a symptom and not a disease. A great majority of the cases are dependent upon malnutrition and intestinal toxemia, and when these conditions are suitably treated, the case improves. The eclampsia case, to which I have already referred, came near a fatal termination. In this instance the toxemia from intestinal sources provided the danger element.

Fatal cases have been recorded as occurring with thymus gland involvement, and here again we have enlarged thymus as a cause of death.

Treatment.—Inasmuch as intestinal toxemia and malnutrition are apparently important agencies in causing the phenomena, attention directed to the intestinal canal and nutrition is indicated. The child should be given 2 drams of castor oil, and milk should be excluded from the diet for a day or two until the stools become normal. This treatment alone has cleared up some of my cases. When the spasm persists, bromid of soda should be given in 2-grain doses every two hours, at least 6 doses in twenty-four hours being given to a child one year of age or younger. Calcium bromid appears to be of some service in controlling the symptoms in 5- or 10-grain doses 4 times daily.

Whether the benefit is due to the sedative action of the bromid alone or the possibility that some of the calcium given is retained as such, is an open question. No satisfactory metabolic experiments have been made to show that such retention takes place when calcium is administered through the alimentary tract. No unpleasant effect has been observed from the use of the drug. In a recent case there was decided retention of sodium chlorid. This was relieved by free catharsis and the use of urea, 15 grains daily in the food. The child recovered in two weeks.

The patient should be kept very quiet during an attack, as undue excitement may precipitate an attack of laryngismus stridulus or convulsions, which may be of a very serious nature. A hot bath at 110°

F. for a few moments, repeated at six-hour intervals, will often have the desired relaxing effect.

The later treatment consists in regulating the child's nutrition. If the malnutrition is extreme, or if the infant is under six months of age, a wet-nurse affords the safest means of nutrition. A wet-nurse, however, is not practicable for children over one year of age. There is, moreover, considerable uncertainty as to how older infants approaching the twelfth month will take the breast. When employment of the wet-nurse is impossible or impracticable, an adjustment of the food to the child's digestive capacity is demanded along the lines laid down in the section on Malnutrition.

Proteid Diet.—Not a few of the infants who develop tetany have had food poor in proteid, such as is furnished by the proprietary foods and condensed milk, or they may have had a low proteid capacity, which, as far as the nutrition is concerned, amounts to practically the same thing. The proteid elements in the diet, therefore, should be kept well in mind in feeding these cases. It is in such cases that peptonized milk and malt soup (pp. 80 and 113) are indicated. The milk should always be given raw, unless the patient's station in life or the season of the year forbids. If the milk is heated, as is necessary in malt-soup feeding, orange or beef-juice should be given at the same time.

Climate.—When possible, children who have had tetany should in every instance be given the advantages furnished by climate. An outdoor life in the country, with open windows at night, is necessary for rapid relief of the weakened physical condition which underlies the disorder.

Bath and Oil Inunctions.—The patient should be given a brine bath (p. 750) at bedtime. This is to be followed by inunction with an animal fat during the cooler months, goose-oil or fresh lard being preferred.

Tonics.—As these patients are usually suffering from a secondary anemia, ½ grain of citrate of iron and ammonium may be given two or three times daily after feeding. The hygienic and dietetic management of tetany is practically the same as that suggested for marasmus and malnutrition.

INSANITY IN CHILDREN

Insanity in children, implying a completely developed functional mental disorder, is very infrequent. When it occurs, its existence may most frequently be traced to hereditary influence. This need not imply the existence of actual insanity in the patient's ancestors, but, in many instances, only pronounced neuropathic diathesis, the effects of which are apparent under conditions of excitement and stress. In certain families there may be a gradual deterioration of the character described by Kirchoff: "In the first generation we find, apart from nervous symptoms, the disappearance of ethical feelings; then follows a generation in which the tendency to excesses appears, and the danger is then greatly increased by alcoholism. In the third generation there is perhaps suicide, or an affective form of insanity, and finally more profound mental disorders appear, such as congenital idiocy."

Probably no less important than heredity are the environment and the early associations of the patient. A child's mental processes are closely dependent on sensory impressions and the affections of pleasure and pain. Desires are inherent, but active volition and self-control are faculties of slow development. Under these conditions phenomena, such as fright, illness, injury, or neglect, exert a greatly augmented influence. The period of puberty, moreover, is responsible for perversions, emotional outbreaks, and other manifestations of instability, which explain the origin of a large group of cases of mental aberration.

Thus, in any individual of neurotic temperament subjected to bodily suffering, overwork, or mental strain, during the period of growth, insanity may occur, and its relative infrequency can be explained only by the remarkable recuperative possibilities of this period.

Imperative Concepts; Morbid Fears.—These constitute the simplest psychic disorders of childhood, and are extremely common and of great diversity, ranging from simple incapacity to resist the fascination of deep water or high places, to uncontrollable fears of darkness or open places and crowds (*agoraphobia*) or lightning and storms (*astraphobia*). Occasionally the child may become overwhelmed by some impulse too great for him to resist, and develop a definite "craze." The most common forms of this are *kleptomania*, *pyromania*, and *dromomania*. Of these, the "running away" impulse is perhaps oftenest recognized as something for which the subject is not fully responsible.

Neurasthenia is much less common in children than in adults, but may develop in children of neurotic ancestry amid any conditions which produce mental or bodily fatigue. Too long school periods, excessive social demands at home, and late hours are among the most common causes, especially in the case of poorly developed children. The usual symptoms of chronic irritability, sleeplessness, and "moods" may give way at last to a state of true hypochondriasis.

Hysteria in its more pronounced forms should be distinguished from mere laughing and crying spells, which children frequently exhibit without complete loss of control. Nevertheless, "in all hysteric subjects," according to Sachs, there is "not so much a direct lack of power to exert the will as a tendency to exert it in perverse fashion." Occasionally, after a period of severe stress, a child may develop hysteric mania. This occurs occasionally in girls on the establishment of menstruation. In cases of true hysteria, sensory and motor disturbances are common, and occasionally hystero-epileptic attacks may occur.

Melancholia is frequent in children, and may assume a serious form, characterized by the development of suicidal tendencies. In most instances, however, the prognosis for recovery is good.

Mania unrelated to hysteria may be induced by great excitement, fright, or febrile diseases. The influence of puberty upon the development of the condition in girls has been noted. Under symptomatic measures involving enforced rest and quiet, maniacal cases in the young usually terminate in recovery after a few months.

Dementia præcox, though not a disease of childhood, is common

after the twelfth year. Hebephrenic, katatonic, and paranoid types are described. The frequency of a prodromal period marked only by neurasthenia and hypochondriasis should be remembered.

Treatment.—The treatment of the psychic disorders of childhood is comparatively simple. Under a firm but quiet home régime, with proper attention to existing physical defects, the milder cases of derangement ordinarily respond favorably. Punishment for the persistence of ideas and fears for which the patient is not directly accountable may do great harm. Hysteric symptoms of considerable duration may, however, yield readily to the right sort of sensory or psychic "surprise." Suggestion has a very wide field in the treatment of children.

In the more severe forms of mania, isolation, close supervision, rest, and hydrotherapy afford good results.

A properly functionating digestive tract and a good supply of hemoglobin and red corpuscles are essential to the preservation of a normal mentality in any child, regardless of heredity or environment.

MALFORMATIONS OF THE BRAIN AND CORD

The various types of cerebral malformation are of developmental rather than of clinical interest.

Meningocele, encephalocele, and **hydrencephalocele** are protrusions of cranial contents through congenital gaps which persist between the bones of the skull. Such defects are most common in the occipital and frontonasal regions.

Fig. 61.—Meningocele.

When the protruding sac consists only of the membranes surrounding the brain, it is called a *meningocele;* when a portion of the brain itself is included, the tumor is called an *encephalocele;* and when the encephalocele contains ventricular fluid, a *hydrencephalocele.*

In **microcephalus** (see Fig. 62) the capacity of the skull is less than normal, and the brain itself is abnormally small. This defective development has been explained by Virchow's theory of premature ossification in the cranial bones, but, according to Sachs, is probably due to atrophic changes, which are the result of hemorrhage or inflammation affecting the brain and its membranes. If the latter be the true explanation of the de-

formity, any treatment of an operative character designed to allow brain expansion by increasing the dimensions of the skull must promise little.

Neither explanation is satisfactory. There is more than a premature ossification. The skull formation along the line of the sutures is excessive. In many cases I have found at the line of the suture a distinct ridge, as though nature had taxed herself to the utmost to unite the cranial bones. With the excessive ossification the bones of the skull generally are much thicker than normal.

Symptomatology.—The symptomatology is the same as described under Cerebral Palsy. The patients are almost always low-grade defectives.

In subjects with microcephalus—microcephalic idiots—who survive infancy, symptoms of paralysis, lack of development of the special senses, and low intelligence are the rule.

Craniectomy.—The operation of craniectomy, based upon the theory that the condition is due to a premature ossification of the skull, was much in vogue several years ago. It was usually unproductive of beneficial results, and has been discarded. Craniectomy was performed on an imbecile boy of four years of age who was under my care at the New York Infant Asylum. After the operation he received more care and attention than before, and he seemed to develop somewhat along mental lines, but when the attention was later withheld, he relapsed into the former condition.

Fig. 62.—Microcephalic idiot.

Porencephalus is a condition characterized by the existence of a hole in the brain substance. This abnormality may be congenital or acquired. The congenital form may develop from a traumatic encephalitis during intra-uterine life. The acquired form is usually due to meningeal hemorrhage. The cavity in porencephalus commonly involves the motor areas of the cerebrum and extends into the lateral ventricle. According to Dana, true porencephalus due to a congenital defect in nutrition occurs in about one-fourth the cases of cerebral palsies in children.

Cyclops, hemicephalus, anencephalus, and **malformations of individual lobes of the brain** belong to the domain of embryology and

neurology, rather than to general pediatrics. The terms themselves roughly define the respective conditions.

Spina Bifida.—Spina bifida is the term applied to a congenital cleft in the vertebral column which permits of a hernia of part of the contents of the canal. The defect is found most frequently in the cervical or lower dorsal vertebræ.

In *meningocele of the cord* the membranes alone constitute the hernial sac.

Myelomeningocele is a protrusion of a portion of the spinal cord and its attached nerve-roots, together with an accumulation of fluid, which usually has its origin in the anterior subarachnoid space.

In *syringomyelocele*, *hydromyelocele*, or *myelocystocele* the central canal of the cord is dilated with fluid, and the cord substance itself forms the lining of the sac.

The malformations just described are frequently accompanied by other abnormalities in the same subject, such as hydrocephalus, club-

Fig. 63.—Spina bifida.

foot, sensory and trophic disturbances, and exstrophy of the bladder. With myelomeningocele and syringomyelocele, paralysis of the extremities, bladder, and rectum may exist.

Diagnosis of the type of spina bifida present in a given case is not always easy.

Simple spinal meningocele is frequently found in the sacral region. This tumor is often translucent. It protrudes through a small cleft in the canal and is pedunculated. It is seldom associated with symptoms of paralysis.

In myelomeningocele and syringomyelocele the swelling is ordinarily less transparent and has a broader base. Pressure on the tumor may cause distention of the fontanel. These forms commonly occur in the lumbosacral region, but may exist in any region of the spine. Paralytic symptoms are much more common than in cases of meningocele.

Of the three forms, syringomyelocele is far the most frequently associated with a hydrocephalus.

Prognosis.—Simple meningocele offers a fair prognosis under treat-

ment. Some cases even terminate favorably by spontaneous rupture of the sac and closure of the cleft in the spine.

In other instances operation may be followed by complete recovery, although in about one-third of the cases the operation is followed by an acute hydrocephalus.

In a very recent case of a child two months of age the beginning of hydrocephalus was apparent ten days after the removal of the meningocele.

The two other forms of spina bifida are very unpromising, and under the best therapeutic measures usually result fatally.

Treatment.—The results of treatment of spina bifida, regardless of its type or the method employed, will scarcely warrant us in promising parents much in the way of improvement. In my hands the injection of iodin has not been of any value. The pressure treatment is unsatisfactory. Surgery promises better results than does any other treatment. Operative measures are fully described in works on surgery, and the results are sometimes brilliant. So-called cured cases, however, often develop internal hydrocephalus, so that the latter condition is worse than the original. Operations, further, are not without immediate danger, for in a great majority of cases portions of the cord are within the sac, the excision of which may result in permanent paralysis and deformity. It is the duty of the physician to see that the tumor is carefully protected and kept clean, and that the child is properly nourished until such time as a suitable operation is thought advisable.

TYPE AND INCIDENCE OF BRAIN TUMOR

Tuberculous tumors are by far the most frequent form of intracranial neoplasms occurring in childhood. More than 50 per cent. of all brain growths belong to this type. Next in order of frequency are gliomata, gliosarcomata, and sarcomata, while adenomata, fibromata, angiosarcomata, cholesteomata, and gummata are all rare in children, carcinomata being exceedingly rare.

Cysts of the brain resulting from an old hemorrhage or from embolic softening may simulate the symptoms of a growing neoplasm if the cyst contents become suddenly increased. Parasitic cysts of the brain (echinococcus or cysticercus) are not unknown in children.

Brain tumors may be congenital, or they may develop at any time after birth. Gowers observed 18.5 per cent. in the first ten years and 14 per cent. in the second decade of life.

MENTALLY DEFICIENT CHILDREN (IMBECILITY; IDIOCY)

It is not desirable, even were it possible, to make a differentiation of the various types of mentally defective children. Mongolian idiocy, cretinism, and amaurotic family idiocy are distinctive types, each type having characteristics of its own sufficient to demand a distinct classification. All other forms are so variable in their etiology and the degree of impairment which they produce that any separate grouping is impossible. Thus we see idiocy due to microcephalus (see Fig. 62),

to hydrocephalus, to antenatal defects, to birth trauma, and to meningitis, particularly of the cerebrospinal form.

Besides microcephalic, hydrocephalic, Mongolian, amaurotic family, and cretinoid idiocy, there is a form of idiocy in which the brain shows sclerotic areas in the cortex. These may be due to hemorrhage at birth. Cerebrospinal meningitis complicated by encephalitis may also be responsible for the sclerosis. Finally there may be porencephalus, a smaller or larger defect in a cerebral hemisphere, either of congenital origin or due to hemorrhage at birth or later.

Unclassified Cases.—Epilepsy in early life tends to mental impairment, and may eventually result in idiocy. I have repeatedly seen cases in which no cause whatsoever could be demonstrated to explain the condition.

The brain, although a most important organ, is very ineffectively protected until the child is well on in the third year. If the facts in each case were known, it would probably be discovered that brain trauma at birth was the cause of idiocy in a large majority of the unclassified cases. Syphilis, consanguineous marriages, and alcoholism are looked upon as etiologic factors by many authors. The mental improvement varies within wide limits, and the cases range from those of complete idiocy to those in which it is impossible to determine whether the patient is within or without the group which is looked upon as normal. Mental impairment is often associated with spastic paralysis; the majority of the unclassified cases show such association. Nevertheless, in the examination of hundreds of cases in institutions, many defectives will be found in whom there is no evidence of muscle involvement.

Fig. 64.—Mongolian idiocy.

Mentally defective children are described as backward, feeble-minded, children of retarded development, imbeciles, and idiots. In a legal sense all are imbeciles who cannot appreciate right and wrong. Idiots show complete absence of responsibility.

Defective sight and hearing may place a child, naturally not mentally keen, in the defective class.

MONGOLIAN IDIOCY

The Mongolian type (Figs. 64, 65, and 66) is found only in the Caucasian race, and received its designation because of the facial resemblance to the Mongolian.

Etiology.—Mongolianism is of congenital origin. There is no known cause. The majority of the subjects are the offspring of parents one or both of whom are in middle life or past that period.

Pathology.—Besides the Mongolian type of face, the microcephalic skull and the retarded bone growth are characteristic of the disease. Mongolian idiots at autopsy show the evidence of faulty development of the brain cortex. The entire brain is smaller and lighter in weight than is normal, and fissuration is defective. Congenital cardiac malformation is not infrequent in these cases, a patent ductus arteriosus or an incomplete ventricular septum being the commonest lesions found. Other visceral malformations occur less frequently, but stigmata of degeneration are very numerous, especially of the palate, ears, and fingers.

Fig. 65.—Mongolian idiot.

Symptomatology.—The face is usually defective in expression, broad and flat, the nose small and broad at the base, the eyes wider apart than in the normal child. In rare cases, the face will show a considerable degree of intelligence (Fig. 65). The eyes are prominent and placed obliquely, with the palpebral fissures extending in an upward direction, elevating the outer canthus. The skull shows anteroposterior narrowing, which, together with the prominence of the upper cervical vertebra, causes a marked narrowing of the nasopharyngeal vault. This is readily appreciated on examining the subject for adenoids, which are supposed to exist because of the habit of the open mouth and mouth-breathing.

The tongue is usually large, and protrudes during a greater part of the time. The muscles of the arms and legs are soft, the skin is usually rather dry and bluish, and there is a tendency to coldness of the extremities. The children have a vacant, stupid expression, and are unusually good-natured. They cry much less than normal children. They are feeble, and the great majority die before they are three years of age. A few grow to adult life. In an institution for the feeble-minded there are but two Mongols in 300 inmates, all over eight years of age. I know two growing children, distinct Mongols, who possess a fair degree of intelligence. Such instances, however, are very exceptional. Development is generally delayed, the teeth appear late, and what speech ability is attained is acquired only after the child is four or five years of age.

Diagnosis.—It is difficult to understand why so many of these cases fail of diagnosis. The patients are not at all like normal children and may only be confused with *cretins.* (For differential diagnosis see Cretinism, p. 704.)

Fig. 66.—Mongolian idiot, showing advanced malnutrition (five months).

Treatment of the Mentally Defective.—The mental defectives, with the exception of the cretin and the amaurotic family idiot lend themselves to one scheme or method of treatment, which is to be considered from two standpoints: first, that of attention to the physical condition; secondly, that of attention to the mental condition. Under the first heading are included the correction of deformities and the management as relates to hygiene and nutrition, both of which should be the best obtainable in any given case. The second consideration, relating to the mental aspect of the case, concerns not only the patient but the family and their immediate interests.

Institutions.—Almost without exception the place for a mentally defective child is in an institution which is devoted to the care and teaching of such children. The defective should be placed where much will not be expected, where he will be associated with others of his kind, where his work and his play will be adjusted and presided over by educated men and women who have made such conditions the study of their lives. The defective has his rights. He has a right to live out his unfortunate life in as pleasant a manner as possible, and this is better accomplished in an institution than in any individual home. In an institution, among other things, such patients are taught, according to their ca-

pacity, useful occupations. Not a few thus taught become self-supporting. At rare intervals one is found who possesses remarkable mental traits along certain lines, traits which the average normal individual is incapable of understanding. I have one such case under my care. Patients showing a moderate degree of infirmity often become skilled in handicraft. They execute mechanically with surprising accuracy. There have been great geniuses of the past who in some respects were not considered mentally normal by their contemporaries. It is impossible to form even a fair estimate as to how the mentally defective child will develop, with age, and suitable instruction from those who are best able to discover his possibilities.

Placing these children in public institutions is often strenuously objected to on sentimental grounds by the poorer members of society because of their fears and prejudices against such institutions. In consequence, many a child is kept at home, greatly to his detriment and to the decided injury of other children in the family. Time and again I have pleaded with the mothers and fathers of such children without avail. Few villages throughout the country do not have an idiot or an idiotic epileptic for school-boys to taunt and for school-girls to fear. Most pitiable objects are these human derelicts, with whom the State does not interfere because they are "harmless." Sooner or later, if he lives, the idiot of poor parentage will become a public charge, and the better his condition at the time, the happier he will be.

Parents of means and intelligence will usually place such a child in one of the many private institutions that are conducted for the care of defectives; but the objection will often be raised, even by these parents, that such children have so little mentality that teaching is useless. This may be true, but on this very account, if for no other reason, the child should be removed from the home because of his invariably pernicious influence on other members of the family.

The vicious, the unclean, and those showing marked moral degeneracy should be placed in institutions as soon after the fourth year as possible. If they are to be a public charge, they should be removed from the home as soon as they arrive at the age limit which the rules of the institution require for admission. A patient who is tractable may remain at home until the sixth or seventh year, particularly if there are no other children in the family. If there are in the family younger children, whose natural tendencies and powers of imitation are always strong, the defective child should be removed as early as possible.

AMAUROTIC FAMILY IDIOCY

Amaurotic family idiocy is the name given by Sachs,* of New York, to a very peculiar disease of infancy, first described by Warren Tay in 1881. It is characterized by an impairment of the muscle functions, volitional movements being at first difficult and later impossible, the changes being of a progressive type. Defective vision

* Sachs' Nervous Disorders of Children, p. 462.

and mental dulness appearing in a normal child are among the early signs. The disease progresses to complete idiocy and blindness. (See Figs. 67 and 68.)

Etiology.—The etiology of this form of idiocy is unknown. It occurs with considerable regularity in Hebrews. Different children in the same family may be affected. The disease, together with many others

Fig. 67.—Amaurotic idiocy. (Early stage.)

whose origin is not understood, has been attributed to syphilis and alcohol. The pathologic findings prove the disease to be due to a toxemia which slowly but persistently attacks and entirely destroys, through degenerative processes, whatever is vital in the entire nervous system.

Pathology.—Consistence is again shown in the lesions of the disease, which, wherever present, are invariably the same.

Fig. 68.—Amaurotic idiocy. Same case. (Late stage.)

Hirsch's early findings have been corroborated by many others, showing that there is a degeneration of the ganglion cells throughout the entire nervous system. If we are to believe these investigations, there is not a normal cell left either in the cortex or the gray matter of the cord.

The cell protoplasm undergoes degeneration, the nucleus is demon-

strable with difficulty and becomes a part of the degenerated cell. Later changes cause an entire loss of cell structure and render it difficult to determine the cell contour.

The ganglion-cells of the retina and the fibers of the optic nerves and tracts are degenerated, this fact accounting for the blindness. Degeneration of the white fibers of the anterior and lateral pyramidal tracts has been described by Shaffer. Sachs is of the opinion that these are secondary changes.

The thoracic and abdominal viscera show no specific lesions.

Symptoms.—The history is usually that of a child born well and who remained in a normal condition until he was five or six, or perhaps nine, months old. He then became inactive, listless, and failed to follow objects or persons with the eyes. In all probability the sight is impaired much earlier than is supposed, as in the four cases which I have had the opportunity to examine blindness was present early in the disease. A marked degree of visual impairment as well as mental apathy will pass unobserved in many of the homes of the class who supply the amaurotic idiot. The eyes assume a peculiar fixed stare fairly early in the disease, not unlike that of the later stage of meningitis. The child not only shows apathy and indifference, but is soon unable to sit up or support the head, which falls in any direction in response to the force of gravity. As the case progresses the patient loses all power—even the power of changing the position of a limb. With the mental, visual, and muscle impairment, there is invariably progressive emaciation. Convulsions and nystagmus may be present but are not characteristic symptoms.

Fairly early in the disease there is an unusual susceptibility to sound; clapping the hands or any inconsiderable noise causes the child to start violently. The reflexes vary at different periods and are variable and unreliable. Toward the end the respiration becomes very superficial, swallowing is impossible, and the child must be fed by gavage. When death occurs, the child presents the picture of marked inanition.

Course and Prognosis.—The onset of the disease is very gradual. Its course is slow, with the evidence of progressive degeneration. The outcome is invariably fatal. A not uninteresting feature of the cases is their similarity. They occur in the same race of people. The onset, course, and termination are alike, even to the time required for the disease to run its course. There is almost a mathematical succession of events.

Diagnosis.—The disease is sometimes mistaken for meningitis. Other cases have been mistaken for those of birth-palsy. Even if there should be occasion for confusion because of the similarity of symptoms, which is very slight, the examination of the eye-grounds, which should be undertaken in every case in which there is a suspicion of cerebral involvement, renders the differentiation possible through the presence or absence of "symmetric changes in the region of the yellow spot in each eye of an infant" (Tay). This lesion Tay and Kingdon have designated as the "cherry red spot." The presence of this sign makes the diagnosis in a suspected case positive.

Treatment.—Treatment is of no avail. Our best efforts for these patients are to be exerted in maintaining nutrition and in ministering to their comfort.

HYDROCEPHALUS

By hydrocephalus is understood an excessive amount of fluid within the skull. This fluid may be either within the brain, in the ventricles (internal hydrocephalus), or it may be external to the lesion, existing as an effusion into the subarachnoid space (external hydrocephalus). Further differentiation is made into the acute and chronic, congenital and acquired, types. A fault in our nomenclature is that there is too much of it. It is a question whether a differentiation into the acute and acquired types is possible, for no one can state that in the cases which develop late—the so-called acquired cases—there was not an excessive effusion at birth. In fact, acquired internal hydrocephalus is an exceedingly rare condition. When it occurs, it is usually the result of some mechanical venous obstruction.

Sachs* states that the most common form of obstruction is that due to tumor in the posterior fossa. Through such obstruction the foramen of Magendie may become occluded, and dilatation of the third ventricle result. Inflammatory processes may cause a closure of the communicating channels between the ventricles and cause a hydrocephalus. The amount of fluid in the acquired cases is usually small.

Congenital Hydrocephalus.—I have seen a large number of these cases, and have made frequent autopsies upon hydrocephalus subjects. An excessive accumulation of fluid develops in the cranial cavities during intra-uterine life, which has been attributed to many causes, among which syphilis and alcoholism are frequently mentioned. My own experience is in accord with that of many other observers, in that no satisfactory explanation for the condition has been found.

Congenital hydrocephalus is essentially chronic. It is an internal hydrocephalus, that form of the disease which is usually seen, and the condition referred to when the term hydrocephalus is used without qualification. The head may reach an enormous size. Holt reports a case in which five pints of fluid were found at the autopsy. In one case seen by me there were three pints; the usual amount is from one-half to two pints.

The fluid is clear, and contains the chlorid of potassium and soda, cholesterin, a trace of albumin, and sometimes urea. As a result of the pressure exerted, the brain substance becomes thinned to a mere shell. The convolutions are entirely obliterated. Removal intact of what is left of the brain may be impossible after the withdrawal of the fluid, owing to the fact that what remains of the brain tissue falls together in a broken mass.

The ependyma may be normal or thickened and infiltrated.

Chronic external hydrocephalus is of rare occurrence. When present, it will be found associated in nearly all cases with a pachymeningitis.

* Nervous Diseases of Children.

The congenital form of external hydrocephalus is exceedingly rare. Very few authentic cases have been reported.

Internal hydrocephalus (*acute*) (*meningitis serosa*) is of infectious origin. Any of the pathogenic bacteria may be operative. As a rule, however, the sudden accumulation of fluid is the result of the presence of the tubercle bacillus, and the symptoms that are presented are those of pressure, seen in the various forms of meningitis.

Symptoms.—In a case of the usual type,—the congenital,—which develops into chronic hydrocephalus, it is noticed at birth that the child's head is large. During the following week it is apparent that the head

Fig. 69.—Internal chronic hydrocephalus.

is increasing out of proportion to the remainder of the body. The skull enlarges symmetrically out of proportion to the face (Fig. 69). There are bulging of the fontanel and separation of the sutures. The blue veins of the scalp become enlarged and prominently outlined in the pale skin. The head may reach an enormous size. In one of my cases the circumference was 28 inches at the time of death—the ninth month. The infant never is able to hold up the head. He is dull and stupid, cries when disturbed, and takes food often with indifference. The facial aspect is characteristic—triangular, pinched, and pale. The eyes take on a peculiar stare and are directed downward, showing con-

siderable paling of the sclera above, and never below. There is usually convergent strabismus, and there may be nystagmus. I have observed the latter in quite a number of cases.

Malnutrition is always present. Dentition is delayed. The hair is scanty and coarse. Resistance is of a very low order.

Nervous manifestations, relating to the extremities, are not necessarily present. I have repeatedly been surprised to note this feature of the disease. Some patients will show a moderate degree of spastic muscular contraction. The hands may be clinched and the feet extended. In others no nervous manifestations whatever will be referable to the extremities.

Duration.—The child rarely lives to the twelfth month. Intercurrent disease, usually a bronchopneumonia or an intestinal infection, terminates the case.

The above is a description of hydrocephalus as usually encountered. The course and outcome, however, are not always the same. The process may be arrested at any time. I have seen a few such cases. The enlargement of the cranium in these patients is slower, and noticeable enlargement may not occur until the fifth or sixth month is reached.

Illustrative Cases.—A private female patient had suffered from digestive disturbance and moderate malnutrition in the early months. She improved satisfactorily, so that an interval of six weeks elapsed without my seeing her. When she was five months old I had occasion to readjust her food, and was astounded to note the change in the size of the child's head. It showed the characteristic globular form, the high forehead, and large fontanel, but there was no separation of the sutures. The circumference was 17 inches. Squint or nystagmus was not present, and the child supported the head well. During the next two months the head increased in size three inches. It remained at 20 inches for four months. The child is now three years of age and is normal in all respects.

Another female patient first came when she was one year old. The mother thought that the head had been growing out of proportion to the body for a few months. The growth continued until the child was two years old, at which time the circumference of the head was 22 inches. The patient was last seen when six years of age. The mother considered the child mentally normal, although we were not convinced that such was the case.

Cases such as the foregoing are those which are reported as cured from time to time by various methods of treatment. Further, they might be looked upon as belonging to the so-called acquired type. Such cases demonstrate that there may be a hydrocephalic process quite active in character which subsides of its own accord, as no treatment was given these patients except proper food and suitable general care.

Many authors maintain that cured hydrocephalus is not at all unusual. Sachs states that the protruding occipital bone, clearly visible on so many bald heads, points to a moderate amount of internal hydrocephalus in the early years of life.

Prognosis.—The prognosis is decidedly unfavorable in those cases in which the hydrocephalus is present at birth. Practically all such patients die before the tenth month. Occasionally one will live to be over one year old. In the cases of slower or possibly later development there is a possibility of spontaneous cure.

Diagnosis.—The diagnosis is not difficult. There is an enlargement of the cranium, which is fairly evenly distended in all directions. The fontanel is enlarged and pulsating, and the sutures are widened.

The veins of the scalp are distended, and nystagmus and squint are present. Early in the case, if doubt is felt as to the nature of the trouble, weekly measurements of the skull will determine whether or not there is an excessive growth.

At birth the head of the average male is 14 inches in circumference; that of the female, 13½ inches. At one year the cranium has increased to 18 inches in boys and to 17½ inches in girls.

At the age of two years the head of the average male measures 19 inches, and that of the female, 18½ inches.

Treatment.—No treatment at the present time will cure hydrocephalus. The cases that recover may have been influenced by suitable feeding and unusual cure; and drugs which may have the effect of producing a better body upbuilding may have some influence on the disease, but of this we are not positive. Many measures of many kinds—medical, dietetic, manipulative, and operative—have been attempted by hundreds of physicians.

Iodid of potash and mercury have been extensively used. Hydrocephalic heads have been bound in elastic, which compressed the brain tissue all the more. The ventricles of the brain and the cerebrospinal canal have been tapped and drained by various methods.

No operative procedure up to the present time has proved of any permanent value.

CEREBRAL PALSIES

Three forms of this affection are recognized—the *prenatal*, the *birth*, and the *postnatal* or *acquired* palsies.

The Prenatal and Birth Forms

Etiology.—Concerning the etiology of the prenatal cases, considerable confusion and varying opinions exist. Degeneracy of the parents, alcoholism, syphilis, and trauma are supposed to be contributory causes. I have seen a large number of undoubted prenatal cases, and am unable to add anything from the etiologic standpoint. In several instances the patients have belonged to families in which there were several other children, all normal, with nothing worthy of note in the family history, and a record of a normal, uneventful pregnancy preceding the birth of the patient.

Trauma at birth, whether due to the use of forceps or to compression of the head in a prolonged or abnormal delivery, may result in meningeal hemorrhages, causing cerebral palsy. An immense number of cases are thus caused. The obstetrician should always keep in mind that with him rests the possibility of making a hopeless invalid or an idiot of the child he is about to deliver. It is fully appreciated that under unusual conditions in obstetric practice certain risks of head injury must be taken for the sake of the immediate demands of the

mother or the child, but the large number of cases of cerebral palsy and idiocy which I have seen have impressed upon me the necessity of treating the child's head during delivery with the utmost care.

Lesions.—The prenatal and birth palsies are often paraplegias or diplegias, and as such show a great variety of lesions.

In the prenatal cases there is often failure of development of a portion of, or an entire hemisphere. Cysts are sometimes found at autopsy. In other cases there will be no visible change to the naked eye. Microscopic examination of the brain tissue shows a lack of development of the cells in the motor areas. In the cases due to trauma at birth the results of the early hemorrhage will be found. The most usual changes are sclerosis and atrophy.

In general, the lesions of cerebral palsy include meningeal and cerebral hemorrhages, thrombosis and embolism, meningitis and encephalitis, direct injury, tumors, atrophy, sclerosis, and cyst formation.

Atrophy, sclerosis, and cysts are the conditions most frequently observed at autopsies. Such changes are apparently secondary, and may generally be ascribed to previous embolism, thrombosis, hemorrhage, or encephalitis.

Meningeal hemorrhage is much more common than hemorrhage from a cerebral vessel. Endarteritis and pachymeningitis are predisposing causes, and direct trauma and the local congestion incident to convulsions or spasms of coughing are exciting causes of such hemorrhage.

Thrombosis and embolism are rare in children, but may occur. Thrombosis is sometimes found in cases of marasmus, and in other instances may be ascribed to syphilitic endarteritis. Emboli are, as a rule, of cardiac origin, and lodge in a branch of the middle cerebral artery. Embolism may occur in the course of acute infectious fevers.

Encephalitis may result from an acute infection or from trauma. Acute polio-encephalitis as a cause of palsy, is well recognized. According to Cautley, three-fourths of the cases of acquired cerebral paralysis in children develop before the fourth year.

Sachs states that, prior to autopsy in a case of acute cerebral palsy of several years' duration, it is impossible to predict what type of secondary brain lesion will be found. When the symptoms have been well defined and focal, and associated with little idiocy, he has in several instances correctly diagnosed the presence of cysts. Idiocy and epilepsy, associated with cerebral palsy, are symptoms which he attributes chiefly to sclerosis.

Symptoms.—Hemiplegia is rare except in the acquired cases. In the prenatal cases, and those due to injury at birth, which latter constitute by far the majority, there is frequently a diplegia or paraplegia. The first symptom of trouble in these cases is usually that of spasticity or rigidity of the extremities, with a decided restriction in motion. There may be rigidity of the neck muscles. The children are often "head-borers."

One extremity may show much more involvement than the other. Spasticity and lead-pipe rigidity characterize the condition of the

muscles. The reflexes are usually exaggerated. Owing to the persistent spasticity, the patient may be unable to walk or use the hands. If walking is accomplished, it is learned much later than is normal. Often walking is interfered with because of spasm of the adductors, which produces a cross-legged attitude. In those cases in which walking is finally accomplished, the patient is very awkward and falls frequently. In a State institution for defectives which I recently visited, 70 out of 300 inmates, ranging from eight years to over forty, had never walked.

The physical development is always of an inferior order in cases even moderately severe. The ability to hold the head erect is accomplished very late. I have repeatedly had patients who could not support the head at the fourth or fifth year. Deafness and blindness are not at all unusual. Nystagmus and strabismus are frequently seen. Speech is apt to be acquired late and may be very defective. The ability to swallow solid food is often very much delayed. Even the swallowing of fluid can be accomplished only in a certain position. A child of whom I had charge for several years could swallow fluids only when resting on his back. The impairment continued during the six years of life of the child. The physical impairment varies widely in degree from what appears as simple awkwardness to complete inability to perform a single volitional act. The legs usually show much greater involvement than the arms. A child who has little or no use of the legs may be able to use the arms to good effect.

Fortunately, many of these unfortunates die during the earlier years. Their resistance to infection is of a low order. Convulsions may occur, but have not been of frequent occurrence in my own cases.

Mentality.—The mental capacity is also of wide variation. I have under my care at the time of writing four patients with normal mentality. Two, through gymnastic exercises and training, are able to perform all volitional acts and are looked upon as normal children. There is still a slight impairment in gait, and they are known among their fellows as "clumsy" boys. The other two, girls, possess unusually bright minds, but are pronounced diplegics. Neither has walked without support. One is eleven years of age, the other, three years of age. The latter will probably walk in a year or two. On the other hand, I have had at various times patients who never appeared to recognize the mother or attendant.

Between these two extremes there are all degrees of mental impairment. Not infrequently these defective children possess decided brilliancy along a certain line, while the mind is a complete blank in other respects. Defectives often learn to accomplish purely mechanical acts very well indeed. They may become intense specialists. A defective boy has developed into an expert carver of wood. I have known two very clever musicians who were defective in every other respect.

Epilepsy.—Authors claim that epilepsy is present in a considerable proportion of defectives. Such has not been my experience. In fact,

in a large experience with children of this type epilepsy has been very exceptional.

The Acquired Form

Hemiplegia may be said to characterize the acquired cases, and while diplegia and paraplegia may occur, this is the exception.

Etiology.—My cases have all been the result of infection, stress, or direct trauma. A comparatively trifling injury is sometimes sufficient to produce a hemorrhage.

Illustrative Cases.—A boy twelve years of age, a pronounced hemiplegic with normal mentality, owes his present condition to a fall from his baby-carriage to the ground when nine months of age. The fall was followed by repeated convulsions and hemiplegia. He came under my care a few days after the fall. The clot was located, the skull trephined, the blood-clot removed, and the bleeding vessel ligated. The boy today walks well with a brace; the arm will probably never be of much service.

Another child, fourteen months of age, was perfectly normal previous to an acute attack of indigestion with high fever and convulsions. The seizures were repeated several times during the day. After the third convulsion it was noticed that there was complete paralysis of the left side of the face and of the right arm and leg. The child died thirteen months afterward. His mentality was never clear.

A mother and her seven-months'-old babe went in bathing at the seashore, the babe in the mother's arms. A ground swell engulfed them. When the child was resuscitated, it was found that there was complete hemiplegia.

My most recent case occurred during pertussis. Hemiplegia developed after a severe paroxysm. The child lost consciousness, which was not regained; and death followed in seventy hours as a result of cerebral hemorrhage.

A child eleven months of age fell to the floor from his crib striking on the head. Hemiplegia developed at once, followed by death in a few hours. Autopsy showed extensive cerebral hemorrhage.

Any of the diseases of bacterial origin may cause cerebral palsy of the hemiplegic type. Infection as a cause, however, is very infrequent. (This opinion is based entirely on my own experience.) More cases probably result from cerebrospinal meningitis than from any other form of infection. The lesions in the cases reported as occurring with various infectious diseases and gastro-enteric disturbances are probably the result of the convulsions which may have ushered in the illness.

A convulsion is never without danger in a child.

Age.—It is unusual for a case to develop after the seventh year. The majority of the cases occur before the third year.

Symptoms.—The first symptom is usually that of *paralysis* following a convulsion or trauma. In some cases there is paralysis (hemiplegia) only; in others, profound mental disturbance. The duration of the paralysis depends upon the nature and extent of the injury. The paralysis, which is spastic in character, may completely disappear, or permanent disability with contractures may remain. Usually there is some impairment of power. The arm functions may be completely restored. The leg improves less rapidly, and is more apt to show permanent disability. (This is the reverse of the experience of most authors.) Not infrequently the patient develops one of the various forms of club-foot, which means that certain muscle groups have been particularly involved.

The facial muscles are involved in a small proportion of the cases—perhaps 15 per cent. Complete restoration to the normal is the rule. The patellar reflex is usually exaggerated on both sides, but most markedly in the leg of the affected side. The gait may be interfered with, or the function of the limb may be entirely lost. In other cases in which the focal lesion is less pronounced, walking may be accomplished after orthopedic attention.

Electric Reaction.—The reaction of degeneration is present.

Sensation is not permanently disturbed. Early in some cases there appears to be some impairment; this, owing to the mental state of the patient, may be difficult to determine accurately.

Disturbance of Speech.—Aphasia is present when there is a left third frontal lobe involvement. Impairment of speech may also occur when the right hemisphere is affected, although to a lesser degree. When the speech center in the left hemisphere is involved, the right may take on the function.

Incoördinate Movements.—Incoördination of the paralyzed parts, particularly of the arm, has been repeatedly observed. These non-volitional movements have been erroneously termed "choreic."

Illustrative Case.—A patient two years of age had, at the age of one year, repeated and prolonged convulsions covering a period of three days. Pronounced hemiplegia resulted, with mental impairment. After one year the hemiplegia entirely disappeared, but phenomena of muscle gymnastics remain that are difficult to describe. The child rocks and sways the body. The muscles of the right side of the face undergo frequent rapid contractions and relaxations. Voluntary muscular acts are readily accomplished. Athetosis is present in a marked degree. There are rhythmic motions of the flexors and extensors of the fingers, and flexors and extensors of the forearm. The child's mentality is still much impaired.

Athetosis is of more usual occurrence in cases in which the lesion has apparently been severe.

Epilepsy may be expected in any case of hemiplegia. Gowers states that it occurred in over 60 per cent. of his cases. Sachs reported epilepsy in 50 per cent. Epilepsy may not occur until several years have elapsed. Thus, in a case of my own, the child had the injury and hemiplegia when nine months of age, and did not develop epilepsy until the tenth year.

Epilepsy, when it develops, is usually of the Jacksonian type, and is often very mild in character.

Mental Impairment.—While mental impairment may be said to be the rule, it by no means follows that a child with hemiplegia may not be perfectly normal mentally. It would naturally be supposed that involvement early in life would be particularly likely to affect the mentality, and such is the case. Nevertheless, I have seen patients with conditions of this nature make complete recovery and become mentally competent individuals. The intelligence may be normal, or there may be complete idiocy, or any degree of impairment between these extremes.

Diagnosis.—The diagnosis is not difficult. In the prenatal and birth cases there are early diplegia and paraplegia, with unmistakable

evidence of mental impairment. The child does not smile or hold up the head or attempt to play with toys at the usual age, and is slow to recognize people or surroundings. There may be difficulty in swallowing and inability to perform volitional acts. All these patients have a characteristic vacant expression—a meaningless stare.

In the acquired cases the paralysis is unilateral, with exaggerated reflexes on the involved side.

Further, there is usually the history of trauma and sudden onset.

Treatment.—The medical treatment of the paralysis consists in maintaining a high degree of nutrition. The management, in general, in the different types of cases, varies, depending upon the intelligence of the patient, the location and extent of the paralysis, and the resulting deformity. Braces are necessary in many instances to prevent contractures and deformities, as well as to aid in correcting those already present. In some of my cases of normal or fair mentality, marked improvement has followed daily systematic manipulations and exercises (p. 798) under the management of an expert in this line of work.

A description of operative measures and a discussion of the cases in which they are applicable may be found in all works on orthopedics. Systematic exercise, massage, and training in the use of the limbs should constitute the later management of all operative cases, in order that the patients may derive full benefit from the operation.

CHOREA (ST. VITUS' DANCE)

Chorea, in the form originally described by Paracelsus, is extinct. In the Middle Ages, however, a form of dancing mania was widely epidemic throughout Europe, and sketches still testify to enormous fourteenth century pilgrimages to the shrine of St. Vitus. The term *chorea* ordinarily applies to the condition described by Sydenham in 1686; and the names *chorea minor*, *chorea vulgaris*, and *chorea anglorum* are synonymous.

Under the general title, furthermore, are grouped such cases as those described by Huntington in 1872 as hereditary in type, and a large heterogenous collection designated by such self-explanatory terms as *chronic progressive chorea*, *chronic adult chorea*, *congenital chorea*, *senile chorea*, *chorea gravidarum*, *posthemiplegic chorea*, *choreic insanity*, and *electric chorea* or *Dubini's disease* (which is marked by the sudden character of the spasms). *Chorea major* is a variety of hysteria.

Incoördination characterizes chorea in children. The child's control over the muscle movement is partially or entirely lost. In addition, there are involuntary muscle movements and twitchings, and there is loss of muscle power.

Etiology.—The disease occurs more frequently in girls than in boys. The proportion in my own cases is two to one.

The susceptible age is from the sixth to the tenth year. The age range in my own cases has been from four to sixteen years. These observations are in accord with those of other writers.

Fright as a factor in causing chorea has been greatly overestimated.

In a susceptible child the occurrence of stress of any nature may induce an attack. Regardless of the nervous shock, there is no chorea without the underlying constitutional vice. Overwork at school is to be looked upon as a predisposing cause, as also is anemia or any influence affecting the well-being of the child. But such conditions are operative only in favorable subjects.

Basing my judgment on a large number of cases both in private and out-patient work, I agree with the accepted opinion of most writers that rheumatism takes a first place in the etiology of this disease. Strümpell several years ago wrote that the association of chorea and rheumatism is so close that it is impossible to separate them. Hirt, in discussing nervous diseases, expressed the view that there is a common toxic etiologic factor which, affecting the cortex, produces chorea, but affecting the joints gives rise to acute articular rheumatism. The association of rheumatism and chorea is certainly most intimate. A trifle over 50 per cent. of my cases either gave a history of rheumatic manifestations, or showed evidence of rheumatism, when first seen, or developed the signs later.

If to the above are added the cases of chorea in which there is a family history of some form of rheumatism, the percentage is increased to over 80 per cent. The association so generally observed clinically is further borne out by the results of treatment.

Pathology.—Much has been written concerning the pathology, and widely diverse opinions are held. The fact that the child makes a complete recovery in a few weeks, and that no permanent lesion is demonstrable after several acute attacks, proves that there is no grave lesion. A systemic toxemia affecting the centers in the cortex is unquestionably present.

Poynton and Paine have found the diplococcus of rheumatism in films made from the pia mater in a fatal case of chorea. The cocci were seen in the vicinity of a blood-vessel. Poynton* gives a cut showing this condition, but no further details. No other author mentions the bacteriologic etiology of chorea.

Symptoms.—The onset of symptoms is most variable. Usually the child will show apparent awkwardness in using one of the hands, or will stumble in walking or will exhibit a hesitancy in speech which is unusual. Such symptoms will be present for a week or more and the child will usually be reproved for his awkwardness in handling his drinking glass, knife or fork. The condition may go no further than this, or, as is usually the case, the nervous manifestations continue. The arms, hands, and fingers may twitch and show short clonic contractions of certain muscles. At the commencement one arm is usually involved more than the other. This tendency to lateral involvement may continue throughout the attack. The order of involvement is usually the right arm, left arm, right leg, and left leg. The limb involved is much weaker than its fellow. This, in the examination of the upper extremities, may

* "The British Journal of Children's Diseases," 1912, vol. ix, p. 49.

be readily appreciated by asking the patient to squeeze the examiner's hand, the patient using first one hand and then the other.

The muscles of the face or of the shoulders, in fact, those of any portion of the body, may be prominently involved, but this is unusual.

In association with the involuntary muscular contractions, there is lack of coördination, a further development of the awkwardness seen early in the attack. The movement of the hand, for example, is slow or absolutely refuses to obey the will, and the movement is only accomplished after pronounced effort or not at all. Thus when a choreic patient is told to place the tip of one index-finger on the tip of the nose or the tip of each index-finger alternately on the tip of the nose in repeated succession, returning the arms in an extended position to his sides, the child experiences much confusion, and the fingers rarely reach the tip of the nose. Another test is to extend the arms in an outward direction and then bring the tips of the index-fingers together quickly. The choreic patient will experience much difficulty in its accomplishment. I have had eight patients under ten years of age who were confined to their beds and who could perform no voluntary act. Self-feeding was out of the question; and walking, an impossibility.

Muscle instability may be further demonstrated by the inability of the patient to maintain muscle tension. Thus, wrinkling the brows or holding the eyes tightly shut can be continued but a few seconds. When the child is asked to protrude the tongue and keep it protruded, the organ may undergo various contractions until it is under control, and even when at rest will show fine fibrillary twitchings. The facial muscles offer a large field for muscle gymnastics with grotesque effects. All or any of the voluntary muscles may be involved. There are incoordination, and lack of power and muscle control.

Diagnosis.—The diagnosis is made on the presence of muscle contractions beyond the control of the will, resulting in awkwardness, grimaces, and inability to effect voluntary effort. Chorea is to be differentiated from habit spasm—so-called "habit chorea"—by the fact that, in the latter, while there are contractions of various sets of muscles in the body, such contractions may be controlled by mental concentration, whereas in true chorea the attempt at control exaggerates the incoördination.

Prognosis.—The prognosis is good. I have seen a large number of cases and have never known one that did not recover if the patient was free from cardiac involvement. I have seen fatal cases of pancarditis (endocarditis, myocarditis, and pericarditis) in which chorea was one of the symptoms of the rheumatic infection, but in every case it was the heart involvement that killed the patient.

Recurrence.—As with other rheumatic manifestations in children, there is with chorea a marked tendency toward a return. In its causation there is, moreover, a seasonal element. The majority of the cases occur in the spring months of April and May. It has not been my observation that the fall of the year is a predisposing factor. Repeatedly in out-patient work where continuous supervision is impossible I have

seen these choreic children return year after year for treatment. We get acquainted with the children and look for their return.

Duration.—The duration of these cases depends upon the nervous organization of the child, the severity of the attack, and the coöperation to be gained from the patient's family. I have had fairly severe cases recover in six weeks, and others that required six months of treatment.

Treatment.—*Rest Treatment.*—The management of chorea depends entirely upon the degree of severity of the attack. It may be necessary in extreme cases to keep the child in bed from three to four weeks. In other cases, in which the attack is milder in character, the enforced rest may do harm. Formerly I treated more cases on the plan of extreme rest than I do at present. When the involuntary movements are so marked as to interfere with locomotion and prevent the child's feeding himself, rest in bed for a week or two is strongly advised. In my observation it is mental repose that the patients particularly require, and if this can best be obtained in bed, then the bed is the best place for the patient. If an absence of mental excitement and stimulation can be secured, with a reasonable amount of outdoor life and exercise, so much the better. An important fact to be remembered in the management of choreic children is that they must not be allowed to become fatigued either physically or mentally.

For the patient who has been confined to the bed for several days or weeks, a gradual return to the usual habits is best. The child should be taken up for one-half hour the first day, increasing the time out of bed one-half hour daily, until he returns to his usual habits of life.

School and Entertainment.—Specific instructions as to the amount of physical and mental rest required can not be given so as to apply generally in the management of chorea. School and entertainments for the choreic patient are, however, out of the question, no matter how mild the case. In the great majority of cases play with other children must be prohibited. Books and play of an exciting nature are to be particularly avoided. The physician should especially remember that there must be no bodily fatigue and no mental stimulation of any nature whatever. How best to bring this about will depend upon the child and his environment.

In two instances I have been obliged to remove the patient from his home to a place among other relatives. The influence of the mother was such as hopelessly to prevent the child's recovery. In a recent severe case of a boy of twelve years, a college student was selected to turn the patient's attention to boyish things, games, target practice, horseback riding, etc. The boy was kept in bed until 9 A. M., rested two hours after the midday meal, and retired at 7 P. M. He was practically well in four weeks.

Antirheumatic Treatment.—By treating every case of chorea as though the disease were rheumatism, my results have been strikingly good. Not only is the child given the salicylates, but he is put on an antirheumatic diet. The tonsils should receive careful attention, and in repeated attacks enucleation should be practised.

Drugs.—The salicylate of soda (true) may be given in smaller doses than are used in acute articular rheumatism—about 5 grains three times daily, with an equal amount of the bicarbonate of soda, being suitable for a child from six to ten years of age. The soda should be given between meals. To children of this age the salicylate may be given either in capsule or in solution. Salicylate of soda (wintergreen) is the form which should always be used. In the treatment of young children, the drugs in solution are more easily administered. During the past year I have given aspirin to a few patients in whom the digestive functions were weak or who could not take the salicylate of soda. In using salicylate of soda or aspirin for a considerable time it is well to remember that they may interfere with the appetite and digestion, no matter how great the care exercised in their use. For this reason it is my custom to give them intermittently—five days of medication being followed by five days without medicine.

In spite of the value of the antirheumatic treatment, this alone will not answer, as I have proved to my satisfaction in not a few cases. The administration of the arsenic and the salicylate and the dietetic régime are begun at the same time. The salicylate of soda is given at once at the commencement of the treatment in as full doses as we expect to give. Arsenic is commenced in a small dose, which is gradually increased in order to establish a tolerance of the drug. Fowler's solution of arsenic is usually employed. In order that no error be made in its administration, a table similar to the following is given to the mother or attendant. For a child six years of age, on the first day, two drops should be given after each meal, as indicated below. Thereafter, the dosage is increased by one drop every twenty-four hours, according to the following schedule.:

DOSAGE OF FOWLER'S SOLUTION FOR A CHILD SIX YEARS OLD

1st day—morning,	2	drops.	Noon,	2	drops.	Night,	2	drops.
2d	"	"	2	"	"	2	"	"	3	"
3d	"	"	2	"	"	3	"	"	3	"
4th	"	"	3	"	"	3	"	"	3	"

This rate of daily increase is continued up to the third week, after which time the dosage should range from 5 to 10 drops three times a day. For a child of eight to ten years of age the amount may be increased to 12 or 15 drops three times a day. I have found that by putting the patient on the antirheumatic treatment much less arsenic is required, and that the patient usually makes an earlier recovery. I have never been obliged to resort to the large dosage of 25 to 30 drops of Fowler's solution three times a day, as suggested by Seguin. It is exceedingly rare that more than 10 drops three times daily will be required in order to procure satisfactory results. I have never found it necessary to give more than 12-drop doses to girls of thirteen to sixteen years old. A very recent aggravated case in a girl fifteen years of age terminated in complete recovery in three weeks under the antirheumatic diet, the use of aspirin, 10 grains three times daily after meals, and Fowler's solution up to 12 drops after each meal.

Children vary greatly as to their tolerance of arsenic. A boy seven years old could not take more than four drops of Fowler's solution three times a day.

In giving arsenic, mothers should therefore be advised that in the event of abdominal pain, diarrhea, coated tongue, foul breath, vomiting, or puffiness under the eyes, the drug is to be discontinued for at least two days. The minimum dose may then be resumed with the same gradual increase.

With the improvement of the case the diet should be continued. The medication may gradually be reduced after all the symptoms have disappeared. It should be continued, however, in from one-third to one-half the quantity for three weeks after the disappearance of all nervous symptoms.

Supplementary Treatment.—It should be remembered that children who have once had chorea are very susceptible to recurrent attacks. This is also the case with children who have had rheumatism. After one attack of chorea the danger of a recurrence should be explained to the mother, who should be asked to bring the child for examination at the first suggestion of involuntary muscular twitching. In addition to this, children who have had chorea, as well as those who have had rheumatism, should be allowed meat but once every second day, and in no case should an excessive use of sugar be permitted. Candy is usually to be forbidden. Believing that these cases are rheumatic in origin, when the attack is over I order that the child shall receive 10 grains of bicarbonate of soda three times daily for five days out of every fifteen. In this way, under a reasonably quiet home life, with no school contests for prizes, etc., a recurrence will almost invariably be prevented.

HABIT SPASM (TIC)*

By habit spasm is understood a semi-incoördinate movement of some portion of the body. The term "semi-incoördinate" is used advisedly, because the spasm may be controlled when the child's attention is directed to it, this being one of the distinguishing features which differentiates it from chorea, in which efforts at control make the spasm worse. The muscles involved in the spasm are usually those of the head, face, or arm. The nose may be drawn up, the chin down, or the head to either side. The muscular spasm is worse when the patient is tired, and occurs more frequently under excitement. While these children cannot be said to have chorea, there is nevertheless a close association between habit spasm and true chorea. Habit spasm is most frequently seen in those of rheumatic inheritance who have had previous attacks of chorea or rheumatism, or the respiratory manifestations so frequently seen in children of the rheumatic type.

Several of my patients developed habit spasm from association with

* Dr. Edward Wheeler Scripture, in his treatment of tics, has his patients stand in front of a mirror and imitate the tic, thus converting it from an involuntary to a volitional one. By this means he shows surprising results, expecially when the tic is of recent acquirement.

children who had some special grimace or habit of muscle contraction of their own.

The cases are readily curable when taken early. In neglected children the spasm may become fixed and continue during the life of the individual. Instances of this sort are often seen in adults. Bad subjects will transfer the spasm from one set of muscles to another.

Illustrative Case.—A boy, twelve years old, came to me because of a peculiar explosive sound similar to that made by eructations of gas. The sound was produced through some process of laryngeal gymnastics and was almost continuous when awake.

Treatment.—The management is dietetic, hygienic, and medicinal.

Diet.—I allow these patients a small portion of red meat once a day. Sugar is given in sufficient amount to make the food palatable. The vegetable and legume constituents in the diet are made prominent. The patient will usually be found to be poorly nourished and often suffering from a secondary anemia, so that a diet best calculated to improve his general condition should be insisted upon. This should contain milk, eggs, poultry, fish, red meat in small portion, high-proteid cereals, and the legumes.

Bath.—A salt bath should be given at bedtime, and immediately after the bath one ounce of goose oil, unsalted lard, or olive oil should be rubbed into the skin.

School Duties.—Temporary absence from school, or a lightening of school duties, and an outdoor life are essential in the successful management of a case. The child should not be allowed to do anything of a strenuous nature. Hard play and any amusement of an exciting character should be forbidden. Fatigue must be avoided. Rest after the noon-day meal for an hour or two is strongly recommended.

Medication.—The medicinal treatment suggested for chorea is also applicable here. If there is anemia, iron may be given, preferably in the form of the extractum ferri pomatum, ⅓ grain three times a day. For those children who cannot take cream or butter, cod-liver oil in teaspoonful doses is a valuable addition to the treatment. The iron may be alternated with the cod-liver oil, each being given for five days. If there is a rheumatic history or inheritance, aspirin or salicylate of soda—preferably aspirin—is to be given in capsule with the iron. The following is useful for a child five years of age:

℞ Liquoris potassii arsenitis . . . . . gtt. iij
Ext. ferri pomati . . . . . gr. ss
Aspirini . . . . . gr. iij
M. Sig.—One dose; to be given in capsule after each meal.

The use of arsenic, while of advantage, does not appear to be as valuable here as in chorea.

Moral Treatment.—Habit spasm, for the reason that it is practically under the control of the will, should be strictly forbidden, rewards being given and punishments imposed, as seem to answer best.

THE PROGRESSIVE MUSCULAR ATROPHIES

The progressive muscular atrophies fall easily into two main groups, called the *amyotrophies* and the *myopathies*. In cases of the first class there are lesions in the spinal cord. In cases of the second group such changes are not found.

Progressive Spinal Muscular Atrophy or Progressive Amyotrophy

This disease has received many designations, including the following: *Chronic anterior poliomyelitis, wasting palsy, Charcot's disease, Duchenne-Aran's disease,* and *amyotrophic lateral sclerosis.*

Some justification for the existence of so many terms is found both in the variable pathologic conditions and also in the length of the period of painstaking research which has made possible our present knowledge of the disease. The conditions observed are, however, fundamentally similar and admit of a common classification.

Etiology.—Progressive amyotrophy is uncommon in early childhood, although Werdnig and Hoffmann have recognized a hereditary form occurring in the very young. Older children and young adults are more frequently affected, and in such instances there is usually no family history of this paralysis and the disease can be ascribed only to such uncertain causes as exposure, overwork, injury, or previous infectious fevers, including poliomyelitis of the acute type. An exception to this rule occurs in the case of progressive muscular atrophy of the Charcot-Marie or leg type. This form is quite definitely a family disease.

Pathology.—The essential change common to all types is atrophy and degeneration of the anterior cornua of the spinal cord. This process involves the cord vertically and is followed by degeneration of the peripheral nerves and the muscles which these nerves supply. Secondary changes in the cord substance consist chiefly of sclerosis and pigmentation which invade the pyramidal tracts and also, in most cases, the anterolateral ground-bundles. Although the cervical and upper dorsal regions are principally affected, the disease may also attack the lumbar region or the motor nerve-cells of the medulla, which supply fibers to the lips, tongue, pharynx, and larynx. Muscular atrophy of the leg type has been regarded as a disease of neural rather than of spinal origin. This form, however, cannot be classed with the myopathies, and quite probably develops from primary degeneration in the anterior cornua.

In a certain proportion of spinal muscular atrophies a marked sclerosis of the lateral columns supplements the usual changes secondary to atrophy of the cells in the anterior horns. "The degenerative process attacks first the terminal fibers and collaterals of the cortical motor neurons. It seems to destroy the tips of the nerve processes, so to speak, without involving the nerve-cell body itself. The next part attacked is the anterior cornual cell" (Dana). Under these conditions the progressive amyotrophy assumes a spastic form and is called *amyotrophic lateral sclerosis.*

Until the complex pathology which has just been briefly traced is further elucidated, the following neurologic conditions may be classified under the general heading, "progressive spinal muscular atrophy":

1. *Progressive amyotrophy of the hand type (or Duchenne-Aran type).*
2. *Progressive bulbar paralysis.*
3. *Progressive muscular atrophy of the leg type (peroneal type or Charcot-Marie-Tooth type).*
4. *Progressive spinal muscular atrophy of the spastic type (or amyotrophic lateral sclerosis).*

Symptomatology.—1. *Progressive amyotrophy of the hand type* typically begins as a wasting of the muscles of one thumb. The adductor pollicis, deep thenar, hypothenar, and the interossei muscles are pro-

Fig. 70.—Pseudomuscular hypertrophy. (Early case.)

gressively involved; and as the paralysis extends, it may affect the flexors and extensors of the forearm, and eventually the triceps and deltoid and other shoulder muscles. The "claw-hand" deformity is common. After several months the paralysis may become bilateral, involving the trunk and rarely the leg muscles, or it may even develop into a bulbar palsy. The paralysis in the hand type of atrophy is usually atonic and flaccid, but may assume a spastic character, with exaggerated reflexes, thus simulating amyotrophic lateral sclerosis. The varying degrees of atony and spasticity are many. In most cases fibrillary contractions occur. Electric responses are diminished and partial or complete reactions of degeneration may be elicited. Complete reactions of degeneration belong, as a rule, to cases of rapid course. Occasionally rheumatoid pains and local paresthesias occur, but sensory disturbances are for the most part lacking.

Fig. 71.—Pseudomuscular hypertrophy.

Fig. 72.—Pseudomuscular hypertrophy.

2. *Progressive bulbar paralysis* is unusual in children. Occasionally it marks the termination of an advancing amyotrophic lateral sclerosis or ophthalmoplegia. Dysphonia and dysphagia are the cardinal symptoms. Localized fibrillary twitchings may occur. Electric irritability is gradually diminished.

3. *Progressive muscular atrophy of the leg type* attacks first the peronei, then the anterior tibial muscles and the calf muscles, and, at a late stage, the adductors of the thigh and gluteal muscles.

In cases of the so-called ascending type the arms and trunk may become affected. At the outset the paralysis and atrophy are unilateral. Fibrillary twitchings and diminished electric responses are observed, but there are no significant sensory symptoms.

4. *Progressive spinal muscular atrophy of the spastic type* combines the symptoms of tonic paralysis with those of progressive wasting. The affected extremities are stiff and weak, reflexes are exaggerated, and in certain instances the lips, tongue, and larynx may be involved.

Course and Prognosis.—In all these conditions the course of the disease is very chronic and extends over a period of years. The progressive amyotrophies are apparently incurable, though remissions in the symptoms are frequent. Atrophy of the leg type is said to offer the best prognosis.

Diagnosis.—Cases of progressive muscular atrophy in children are to be distinguished from those of primary myopathy, peripheral neuritis, acute poliomyelitis, and hereditary ataxia. The individual forms of amyotrophy should also be distinguished. Without attempt to enumerate all the factors valuable in these differentiations we may group together the following points:

In the *amyopathies:* Family history and absence of fibrillary tremor and reaction of degeneration.

In *neuritis:* Symmetric distribution of paralysis, possible toxic origin, frequent existence of sensory symptoms, and absence of family history.

In *epidemic poliomyelitis:* History of acute onset and rapid course.

In *hereditary ataxia:* Characteristic tottering gait, normal electric reactions, and hereditary influence.

Treatment.—This is only symptomatic and palliative. Electricity may be applied to the wasted muscles and to the spine. The drugs used are calculated to exert a tonic action on the nervous system, and include iron, arsenic, quinin, and strychnin. Mercury and potassium iodid may be tried in cases of possible syphilitic origin.

The Progressive Amyotrophies (Primary Muscular Dystrophies)

These include three types:

1. *Pseudomuscular hypertrophy* (Figs. 70, 71, 72).

2. *Progressive muscular atrophy of Erb's juvenile type*, or *the scapulohumeral type.*

3. *Infantile myopathy of the facioscapulohumeral type*, or *Landouzy-Déjérine type.*

Etiology.—In these cases there is very frequently definite evidence of heredity. With the exception of the juvenile dystrophy of Erb, which occurs most frequently in early youth, these conditions begin to develop before puberty, usually between the third and tenth years. Pseudomuscular hypertrophy is more common in boys than in girls, yet is apparently transmitted through the maternal parent. While in many instances the first symptoms of weakness follow an acute illness, it is doubtful whether trauma and acute diseases are truly causative factors.

Pathology.—According to Erb, the muscular changes are essentially due to trophic disturbances. In spite of this there are no demonstrable primary lesions in the nerves or spinal cord. In the muscles themselves there is a complex degenerative atrophy which is characterized by a preliminary increase in the size of the muscle-fibers and the number of nuclei, followed by disintegration of these fibers, increase of connective tissue, and lipomatosis. Although the degeneration is attended by hypertrophy, the end-result is, therefore, atrophy.

Symptoms.—These have been conveniently outlined by Sachs as follows:*

TYPES OF PRIMARY DYSTROPHIES

	Muscular Pseudo-hypertrophy	Juvenile Form of Progressive Muscular Atrophy (Erb's Type)	Type Landouzy-Déjérine
Part first affected	Legs (calves).	Shoulder-girdle.	Face and shoulder-girdle.
Distribution of hypertrophy	Calves, rarely thighs.	Muscles around shoulder-girdle and pelvic girdle.	None.
Distribution of atrophy	Thighs, deep muscles of back, shoulder, and scapular muscles. Calves during later period; at that time also general atrophy.	Thighs, deep muscles of back, upper arm. Hypertrophied parts may become atrophic in later stage.	Face muscles, including lips and orbicularis palpebrarum; shoulder and scapular muscles.
Parts remaining normal	Face, forearm, and hand, except in last stages.	Face, forearm, hand and leg muscles, except in last stages.	Forearm, hand, and legs, and deep muscles of back.

The "waddling gait," difficulty in rising from the floor (Fig. 70), and large, hard calf muscles constitute the most prominent features of the pseudo-hypertrophic form. The "myopathic face" distinguishes the Landouzy-Déjérine type.

In all the forms there are no fibrillary twitchings and no complete

* Sachs' Nervous Diseases of Children, p. 421.

reactions of degeneration. The reflexes may be normal. As the paralysis progresses they are diminished.

Diagnosis.—The primary muscular dystrophies are not often confounded with other diseases. A consideration of the history, together with a study of the electric and mechanical behavior of the affected muscles, will usually render easy the distinction between a case of amyopathy and one of amyotrophy.

Course and Prognosis.—These cases extend over a period of many years, frequently terminating in death from some secondary disease.

Treatment.—Orthopedic measures designed to correct existing deformities and complement the action of partially degenerated muscles afford the best results. Moderate massage and judicious use of electricity and exercise are of value. Further treatment consists only in the maintenance of nutrition and the administration of drugs to relieve temporary symptoms as these may arise.

EPILEPSY

"Epilepsy," declares Spratling, "is the strangest disease in human history. It respects no race, no class, no age, no occupation. It may be in the infant at birth or delayed till extreme old age, even ninety years or more." Some of the most notable characters in history, including Cæsar and Napoleon, are reported to have been its victims, and the existence of the affection in very remote times is proved by the ancient descriptions of *morbus sacer* and *morbus comitialis*. The term "*falling sickness*" best corresponds to Lucretius' portrayal of how the patient, "struck as with lightning," drops; while *morbus Herculeus* might well characterize the second stage of a severe seizure.

Today, in spite of a growing knowledge of contributory causes, most potent of which is heredity, we are still ignorant of the essential nature of the disease.

Statistics show that from one to three persons in every thousand throughout Europe and America are epileptics, the proportion of males being slightly in excess.

Lengthy discussions will be found in works on neurology relating to various features of the disease. To these works the reader is referred, although in them he will find but little that is illuminating.

Epilepsy is not a disease of infancy, and while cases have been reported as occurring in children under one year of age, such occurrences are unquestionably very rare. I have treated a large number of children who have had infantile convulsions and who never developed epilepsy. Neurologists are inclined to attribute a varying percentage of the cases of epilepsy to infantile convulsions, dentition convulsions, etc. The neurologist does not know of the hundreds of such cases seen by pediatrists and practitioners in which there is never further trouble. While a certain percentage of epileptics may have had convulsions in infancy, a much larger percentage of infants have convulsions without further trouble.

I agree with Koplik, who states, "Epilepsy bears no demonstrable

relation to infantile convulsions. The fact that the patients developed the disease at an early age helps in no way to explain the condition, and the underlying factors in epilepsy are the same regardless of the age of the patient. Thus what constitutes epilepsy is yet to be determined. Various brain lesions have been found in association with epilepsy, and to them the seizures have been attributed, and yet these lesions and more pronounced involved areas are found at postmortem without the occurrence of epilepsy."

Types.—Clinically, epilepsy may be divided into two types, *petit mal* and *grand mal.*

Petit Mal.—This form may occur independently, or in association with grand mal. One person may be subject to both kinds of attacks. In petit mal there is a temporary or partial loss of consciousness without convulsion. The child may simply hesitate in his play and grow pale. There is a dull look in the eyes, then the attack is over, and the play is resumed. The attack may manifest itself in what corresponds to a fainting attack, in which the child loses color and sinks to the floor, but is normal in a few moments.

Illustrative Cases.—A girl two years old with a good family history had two "fainting attacks" on two successive days. The attacks apparently consisted of a temporary clouding of the mentality, with a tendency to fall. During the past two years the child has had six of these attacks.

In a child treated several years ago the only signs of the disease were manifested by a sudden cessation of play, when the patient would gaze into space for a few seconds only, with dilated, fixed pupils and a vacant stare.

Grand Mal.—The epileptic attack is in most cases preceded by prodromal symptoms, known as "*the aura,*" which consists of a warning by which the patient knows the attack is coming on. The aura is described as a peculiar sensation felt in some portion of the body before the attack and at no other time.

Illustrative Cases.—A boy patient had what he described as a pain in the side. It was always in the same side and the area of the pain was not larger than a silver dollar. Numbness, tingling, and a feeling of soreness in the stomach have all been described as constituting the aura.

Another boy patient of eight years could always anticipate an attack through a feeling which he could not describe in the right leg, and which traveled up to the abdomen.

In grand mal there are loss of consciousness, dilatation of the pupils, foaming at the mouth, stertorous breathing, and biting of the tongue due to spasm of the jaw muscles. The muscle spasm gradually lessens, consciousness slowly returns, and the patient passes into a deep sleep. Every variation of the above symptoms may be encountered.

The nature of the convulsive movement may help to determine the nature of the disease. Localization of spasm in one portion of the body or one set of muscles indicates some distinct local lesion in the brain.

Diagnosis.—The diagnosis of epilepsy is not difficult. Repeated convulsions after the age of infancy are always epileptic. An infant may have repeated convulsions and yet not have epilepsy. I have

seen this time and again. However, if a child two or more years of age has repeated convulsions, even at intervals of several months, the condition must be looked upon as epilepsy.

A girl of fifteen had a nocturnal attack. She is now twenty-seven. There have been five seizures and all at night. Cases of this nature constitute epilepsy just as truly as though the attacks had occurred in as many months.

Diagnosis.—Diagnosis in children is easy, because children do not have repeated innocent fainting spells. Neither are hysteric seizures at all common, and when they do occur they simulate epilepsy to such a slight degree that a differentiation is superfluous.

Prognosis.—The prognosis of epilepsy as to a cure is bad. The outlook for many of these is hopeless; nevertheless, under a régime involving right living, proper diet, and avoidance of excitement, many epileptics undergo but little inconvenience. The young woman mentioned above has not had an attack in nine years. True, she is under observation and treatment continuously.

There are plenty of examples in history of men who were epileptics who have gained marked distinction.

Treatment.—In the management of epilepsy practically all we can hope to do is to diminish the frequency of the attacks which characterize the disease, whether it be grand mal or petit mal. Proper nutrition, rational habits of living, and pleasant outdoor occupations are of inestimable service in the management of the epileptic. The management which has served me best has been directed, first, along general and hygienic lines; secondly, it has involved the use of drugs. Our aim should be to make the patient physically as normal, as vigorous, and as resistant to attacks as lies in our power.

General Considerations.—Visual defects, enlarged tonsils, adenoids, phimosis, and irritant skin lesions must all be corrected before beneficial results are to be expected from any line of treatment. The patient should then be placed under the best environment permitted by his station in life. Outdoor life, sports, and games are to be encouraged, always within the bounds of moderation. The child should sleep in a cool room with the freest possible ventilation at all seasons of the year. If he is a school-child, he should, if possible, be instructed at home and given short sessions with easy studies. In work or play the patient should never be allowed to reach the point of mental or physical fatigue. This, to my mind, is most important. Emotional plays at the theater and exciting amusements elsewhere are forbidden.

Diet and Bowel Function.—The diet is to be adjusted to the child's digestive capacity. A diet suitable for the age is given, just as for the normal child (p. 96), meat being allowed only once a day. As intestinal indigestion and toxemia from intestinal sources are unquestionably important etiologic factors in causing a recurrence of the seizures, careful attention to the bowel function and diet are most important features of the treatment. The epileptic patient under my care is never allowed to pass over twenty-four hours without an evacuation of

the bowels, and if, in the opinion of those in charge, the evacuation is not as copious as usual, an enema is given. If there is a suggestion of constipation, the treatment with the oil enemata, or other means as recommended for chronic constipation (p. 242), is instituted. In cases in which heredity and toxic influences prevail, the importance of attention to the diet and habits of life cannot be overestimated. When there is a focal lesion, attention to the details of living will have less influence, but always, surely, some influence, in diminishing the frequency and severity of the seizures by establishing a more vigorous physical resistance.

Colony Management.—During the past half-century the colony treatment, which began in Germany with a successful private attempt to house four patients separately, has become wide-spread, and at present this method promises the most practical and far-reaching results. When parents are unable to give the patient suitable attention at home, I urge that he be placed in one of the excellent institutions devoted to the care of epileptics, where the whole manner of life is adjusted and regulated with one object in view. The colony management offers advantages that cannot be secured elsewhere.

Drugs.—There are few drugs in the pharmacopeia, particularly those of a sedative nature, that have not been used at one time or another in the treatment of epilepsy. The bromids unquestionably serve our purpose in controlling the seizures better than does any other form of medication. The size of the dose is variable. Because of their peculiarly depressing effects upon the child's mental condition the bromids should be given in as small quantities as are compatible with the beneficial result desired—a diminution in the number of the convulsions. To a child ten years old, 10 grains of sodium bromid ordinarily may be given, well diluted, in one-half glass of water after meals. The amount may be increased or diminished as the progress of the case demands. If the convulsions are nocturnal, in a child of ten years, large doses—from 20 to 30 grains—should be given at bedtime. In the event of the discontinuance of the drug to the point where it is given but once a day, the time selected should be bedtime. If there is continued improvement under the bromid, it may be given on alternate nights, and finally every fourth night.

As ocular defects may be important factors in causing epilepsy, every child with epilepsy should have the eyes examined by a competent oculist.

Illustrative Case.—I have still under my care the young woman already twice referred to. The first convulsion occurred at the fifteenth year. It was a typical nocturnal seizure. Fifteen grains of bromid with 5 drops of the tincture of belladonna were given three times daily for three months, when the bromid was reduced to 30 grains daily. This was continued for one month, when a death occurred in the family which doubtless helped to incite a second attack. At this time, as the patellar reflex was scarcely perceptible and the bromid rash was considerable, the drug was discontinued. At the end of two months the daily dosage was placed at 20 grains, with 10 drops of tincture of belladonna. This was continued for four weeks, when there was a third attack, without any apparent cause of an exciting nature beyond the fact that the patient had allowed herself to become obstinately constipated. This

was her last attack. Five years have since intervened. The bromid has been gradually reduced, first to 10 grains daily at bedtime, then every other day. Now it is taken only every fourth day.

ACUTE POLIOMYELITIS (INFANTILE PARALYSIS)

Anterior poliomyelitis is an infectious and a transmissible disease.

Etiology.—From the brain and spinal cord of human cases of poliomyelitis, as well as from experimental cases of the disease in monkeys, Flexner and Noguchi* cultivated, by anaërobic methods, a globular or globoid body smaller than any known coccus, 0.15 to 0.3 μ in size, and staining pale reddish-violet by Giemsa's solution. Noguchi also demonstrated identical bodies in films prepared directly from the nervous tissues.

These cultures, when inoculated into monkeys, have caused typical experimental poliomyelitis.

The virus resists freezing for a period of forty days, and drying for seven days, but becomes inert after exposure to 45° to 50° C. for half an hour.

Pathology.—The lesions produced by the virus of poliomyelitis are, naturally, most marked in the nervous system, but they are present in other viscera as well. In the nervous system the gross lesions are not always very pronounced. They may appear in the spinal cord, pons, medulla, and cerebrum, and consist of congestion and minute hemorrhages, chiefly into the gray matter. The lesions of the spinal cord are not confined to the anterior horn. On microscopic examination the most marked lesions are found in the cord at the level corresponding to the most completely paralyzed muscle groups. The meninges show perivascular infiltration with round-cells, chiefly lymphocytes, but there is no exudation on the surface. The infiltration extends along the nerve-roots and penetrates between the fibers. In the gray and white matter of the spinal cord there are focal lesions consisting of edema, perivascular cellular infiltration, numerous hemorrhages, and degeneration of the nerve-cells and fibers. The anterior horns of the gray matter show more marked lesions than do the posterior horns, the nerve-cells being sometimes replaced by leukocytes. The cells in a segment are always unequally involved. Similar focal lesions may be present in the medulla, pons, and cerebrum. The intervertebral ganglia show infiltration with lymphocytes between the nerve-cells and fibers, and some ganglion-cells show degeneration and necrosis.

The primary lesion seems to be in the meninges, and the cellular exudate about the vessels, with their resulting partial destruction, leads to secondary lesions in the nervous tissue itself.

In other viscera the lesions consist of hypertrophy of the lymphoid tissue, including that of the tonsils, the thymus gland, the superficial and deep lymphatic glands, the small intestines, and the spleen. There are also minute focal necroses in the liver.†

* "Jour. Amer. Med. Assoc.," 1913, lx, p. 362.

† Flexner, Peabody, and Draper: "Jour. Amer. Med. Assoc.," 1912, p. 109.

Cerebrospinal Fluid.—The cerebrospinal fluid shows changes varying with the stage of the disease. The cell count is almost always increased, being highest during the early days of the attack, and falling off progressively as the attack goes on, reaching the normal in two weeks. In the majority of cases the fluid shows lymphocytes and large mononuclear cells only, but the polymorphonuclear cells may amount to 90 per cent. of the total.* The globulin content is normal during the early days, but increased after the first two weeks. It may remain above the normal for seven weeks or more. Draper and Peabody also found that the blood shows a constant marked leukocytosis, sometimes as high as 30,000. The polymorphonuclear leukocytes are increased 10 to 15 per cent., while the lymphocytes are diminished from 15 to 20 per cent.

Transmission.—Recent advances in our knowledge of the etiology and pathology of anterior poliomyelitis date from the work of Landsteiner and Papper in 1909. They succeeded in inoculating monkeys intraperitoneally with material obtained from a fatal case of the disease in a child. Knoepfelmacher also succeeded in producing poliomyelitis in a monkey by the inoculation of human material, but these workers were not able to transmit the disease from monkey to monkey. Flexner and Lewis succeeded in doing this without difficulty, using the intracerebral method of inoculation and carrying their strains of virus through many generations. Flexner and Lewis were also able to transmit poliomyelitis to monkeys by means of subcutaneous and intravenous inoculation, though not in all cases were such experiments successful. On the other hand, intranasal inoculation in monkeys gives results that are almost positive, while intraneural inoculation, as practised by Leiner and v. Wiesner, is less uniformly successful.

The Nasal Mucous Membrane.—Flexner and Lewis showed that the nasopharyngeal mucosa is a regular site of elimination for the virus of poliomyelitis in monkeys experimentally inoculated with the disease, and Landsteiner, Levaditi, and Pastia demonstrated the same method of excretion of the virus in a human patient dying during the acute stage of poliomyelitis. Flexner and Clark also found the virus in the tonsils or nasal mucosa of human cases, and Flexner has suggested that "the nasopharynx acts in human beings as the portal of entry of the virus into the central nervous system, as well as its source of dissemination to other human beings." In monkeys, and also probably in human beings, the virus may disappear from the nervous system and from the tonsils and nasopharyngeal mucosa in from eight to ten days after the onset of the paralysis, or it may persist there for three or four weeks. The observation of Osgood and Lucas, who found that the nasopharyngeal mucosa of monkeys was still infectious five months after the acute stage of an attack of poliomyelitis, would seem to be exceptional and to indicate that chronic carriers of poliomyelitis may develop.

The Virus.—The virus of poliomyelitis is regularly present in the central nervous system, and less frequently in the tonsils, nasopharyngeal mucous membrane, and mesenteric lymph-nodes. It has not been

* Draper and Peabody: "Amer. Jour. of Dis. of Children," vol. iii, 1912.

found in the large viscera nor in the blood. The spinal fluid from a human case of poliomyelitis is capable of producing the disease when inoculated into a monkey.

It has been pointed out that epidemics of poliomyelitis develop along the route of human travel. Flexner and Clark showed that stable-flies may harbor the virus on their bodies for a period of at least forty-eight hours, and that it may remain in their viscera for the same length of time.

Immunity.—Flexner and Lewis proved that monkeys which have recovered from poliomyelitis are immune to further attacks of the disease. They further showed that the blood of these immune animals contains neutralizing principles. Netter and Levaditi demonstrated the presence of such neutralizing principles in the blood of an abortive case occurring in a child.

Type of Cases.—For clinical purpose poliomyelitis may be divided into three types: the *abortive,* in which no paralysis occurs; the *cerebral,* representing the rare cases with resulting spastic paralysis; and the *bulbar spinal group,* which comprises all cases with lesions in the lower motor neuron, and flaccid paralysis.*

Seasonal Influences.—While the disease may appear at any season of the year, a vast majority of the cases develop between July and October.

Age Incidence.—Although poliomyelitis is a disease of childhood, cases occurring in adults are not at all uncommon. In some recent epidemics adults have numbered as high as 20 per cent. of the cases. In the 1907 New York epidemic the youngest patient reported was two weeks old. The most susceptible age is from the eighteenth month to the sixth year. Males are affected more frequently than females.

Period of Incubation.—From five to fourteen days is generally accepted as the period of incubation. This observation is based upon the results of clinical and laboratory investigations.

Symptoms.—As in all infectious diseases, the symptoms vary widely. In a great majority of the cases there are decided prodromal symptoms.

During the 1907 epidemic I had the opportunity in hospital and consultation practice personally to observe 43 cases. During the early period of this epidemic the cases were very severe. The most constant early symptom was fever. Usually there was a sharp rise of temperature—in a number of instances to 105° or 106° F. The duration of the fever was variable—from one day to a week. In some cases there was a sharp, sudden rise and rapid fall. In a few there was very slight temperature, and in others none at all. In this epidemic and in the cases that have been seen since, gastro-intestinal symptoms predominated; thus there was vomiting and diarrhea or a sharp attack of vomiting. A peculiar feature of my cases has been that the severity of the gastro-intestinal symptoms has borne no relation to the degree of the resulting paralysis. Ordinarily the paralysis is not noticed until the third or fourth day of the prodromal stage. Pain and hyperesthesia are very prominent symptoms in many cases. The patient begs not to be dis-

* Draper, Peabody, and Dachez: "Rockefeller Institute Reports," No. iv.

turbed; manipulation of the body and moving the limbs give rise to most intense pain.

In the so-called abortive cases the gastro-intestinal symptoms may be very active and the temperature high, with only slight and temporary paralysis.

The nervous manifestations may be very urgent; thus convulsions, apathy, and stupor are not uncommon. In five of my cases seen in consultation a diagnosis of cerebrospinal meningitis had been made by the attending physician, because of the presence of Kernig's sign and neck rigidity, in addition to apathy and stupor. In all these cases a lumbar puncture was required for differentiative purposes.

Pain in the extremities and muscle soreness are present in a considerable number of cases, and hyperesthesia may be present for a few days. Early in the disease, before the paralytic stage, the reflexes may be exaggerated. The paralysis appears from two to four days after the acute onset. It may involve an entire limb, or be limited to muscle groups irregularly distributed. The extent, degree, and permanency of the paralysis depend upon the severity of the lesion in the cord. Lesions in the lumbar enlargement are the most frequent and cause the greatest number of cases of paralysis. Involvement of the cervical enlargement causes the next largest number of cases.

Wickman reported the distribution of the lesions in 868 cases as follows:

1. One or both legs	353
2. One or both arms	75
3. Combination of arms and legs	152
4. Combination of legs and trunk muscles	85
5. Combination of arms and trunk muscles	10
6. Trunk muscles alone	9
7. Paralysis of "the whole body"	23
8. Ascending paralysis	32
9. Descending paralysis	13
10. Combination of spinal and cranial nerves	34
11. Cranial nerves alone	22
12. Localization of paralyses not given	60

In about one-half of the cases the paralysis is limited to the legs.

The Cerebral Type.—The cerebral type, in which a differentiation is difficult, presents clinically a symptom-complex which distinguishes it from the foregoing. This condition was designated as polioencephalitis by Strümpell. The onset in these cases is with fever, convulsions, vomiting, strabismus, and coma. The reflexes are usually exaggerated.

Imbecility, epilepsy, and spastic paralysis may be the outcome. Cases are often designated as cerebral which strictly do not belong to this type. In view of the fact that the infection is a general one, involving the entire nervous system, cerebral symptoms are necessarily present in many cases. The fact that these manifestations promptly disappear means that no permanent lesions were present, and that the brain shared in the toxic systemic effects.

The Abortive Type.—That there are many cases of poliomyelitis which do not pass to the paralytic stage is the opinion of all observers who

have seen many cases of the disease. In the epidemic of 1907 several such cases came under my observation. Prodromal symptoms were very urgent in two patients who developed slight leg weakness and absence of patellar reflex. Both recovered in three weeks. In two others, a boy and girl in the family of a physician, the prodromal symptoms were rather mild and both developed a slight paralysis of short duration.

Wickman believes that over 25 per cent. of the cases belong to the abortive type. There is no apparent distinction to be made between the symptomatology of the abortive cases and those that go on to the development of paralysis. Muller* believes that the abortive cases outnumber those of paralysis. This view receives striking support from the recent demonstration of typical visceral lesions, indicating that there is a general systemic infection. With such pathologic findings, symptoms such as fever and malaise are reasonably to be expected. It may be that the abortive cases are those in which this general process is present, but in which the nervous system has been spared. Netter and Levaditi† have demonstrated that the serum of abortive cases neutralizes the virus *in vitro*, just as does the serum of the patients that develop paralysis. It is quite probable that in the past many of the abortive cases have not been recognized, and in certain cases at least, the apparent immunity of adults may be dependent upon such a previous, unrecognized attack. That the neutralizing substance in the blood may persist for a long period following an attack of the disease, and probably immunity be present as well, is shown by the case of a man who had been paralyzed thirty years before, and whose serum still protected a monkey from the virus.

Course.—Following the prodromal symptoms, flaccid paralysis, loss of knee-jerk, and atrophy appear. The paralyzed part becomes smaller than the corresponding limb or muscle group. The limb becomes cooler than the normal. Subluxation of a joint, due to relaxation of the ligaments, is not an uncommon occurrence in cases in which there is extensive paralysis.

Electric Reactions.—During the onset of the disease the electric irritability of the affected muscles and nerves is increased. After two or three days, however, these nerves fail to respond to stimulation, and the paralyzed muscles contract only under the galvanic current, showing the typical reaction of degeneration (an anodal opening contraction greater than the kathodal closure contraction). Galvanic irritability in the paralyzed muscles may be increased for several months, but thereafter diminishes, and after a year or more disappears.

Prognosis.—The prognosis in this disease must cover not only the mortality, but the resulting permanent paralysis as well. The mortality varies with epidemics; roughly it may be said to range from 5 to 20 per cent. The younger the child, the less the danger to life is a rule borne out by experiences in many epidemics. The disease is more fatal after the fifteenth year. In the Springfield, Mass., epidemic, 7 patients were

* Draper, Peabody, and Dachez: "Rockefeller Institute Monograph," No. iv.

† Netter and Levaditi: "Compt. rend. Soc. de biol.," 1910, lxviii, 617.

over fifteen years of age. Of these, 3 died. In the fatal cases death usually takes place by the fifth day.

Prognosis as regards permanent paralysis is most difficult. Cases with very severe prodromal symptoms may have no permanent effects. The degree of damage depends upon the severity of the lesion in the cord, and this is impossible of demonstration. I have seen cases in which the paralysis was complete make perfect recoveries, and other cases of similar nature, followed by permanent residual paralysis. A child of eighteen months had complete paralysis of the neck muscles and all four extremities. In this case the outlook apparently was hopeless, and yet the child made a perfect recovery.

Permanent paralysis may follow very mild prodromal symptoms.

The prognosis is further influenced by the possibilities of continued treatment. Many cases admit of much improvement through properly directed management continued over long periods. Among 530 cases collected by Wickman, 56 per cent. were paralyzed, 44 per cent. cured after eighteen months. In Massachusetts there were 16.7 per cent. of complete recoveries.*

Quarantine.—While observations as regards the communicability of the disease are somewhat at variance, the safe rule is to maintain a quarantine of the infected child for at least four weeks.

In several States in this country, and several European countries, notification and quarantine are required by law.

Treatment.—During the acute stage of the involvement of the cord our efforts count for little. We order that the child be kept quiet in bed, that a laxative be given, and that he receive light, easily digested nourishment; and then, so far as the immediate conditions are concerned, we have done our little, but our all. I have used the bromids and ergot and the iodids internally, and ice-bags and blisters over the spine at the site of the lesion, and am yet to be convinced that they are worth the annoyance which they cause the patient, or that the drugs are worth the indigestion they are apt to occasion. That the disease is due to an infection is now proved, and in a given case our hope must be that the infection will be mild in character. The degree of involvement determines the resulting atrophy and loss of function.

Later Treatment.—From ten days to two weeks after the acute stage has passed our efforts should be directed toward maintaining the nutrition of the affected muscle or groups of muscles. This is to be done by mechanical means, electricity, and gymnastic exercises (p. 771).

The beneficial action of electricity consists largely in exercising the muscles no longer under voluntary control, and thus increasing their circulation and nutrition. The immediate object of the electricity is to induce contraction of the muscles. Either the faradic or the galvanic current may be used. The faradic should first be tried, and if to this there is no response, the galvanic should be used. Sittings of five to fifteen minutes may be desirable, depending somewhat upon the age of the child and the duration and extent of the lesion. The longer the duration

* Draper, Peabody, and Dachez: "Rockefeller Institute Reports," No. iv.

of the disease, the longer should be the sittings. Once daily the parts should be massaged by one skilled in the work. When such a person is not available, the mother or nurse may undertake with some advantage the systematic manipulation of the affected muscles by kneading and rubbing. Gymnastic exercises are unquestionably of very much value, but must be carried out over a long period of time. Cases showing marked atrophy and paralysis and which promise little, often show surprising improvement and restoration of function under properly directed exercises and manipulative treatment. The further management is orthopedic, and consists in the prevention of deformities by the use of splints and braces, and their correction by tenotomies and tendon transplantation.

MULTIPLE NEURITIS

Multiple neuritis or polyneuritis is an acute inflammatory disease of the peripheral nerves, degenerative in character, and usually symmetric in distribution.

Etiology.—While the great majority of cases observed in children follow diphtheria, this disease is by no means the only causative factor. The neuritis may be due to various toxic agents, bacterial and otherwise, producing an inflammation and degeneration of the peripheral nerves. Among the possible causes, other than diphtheria, are malaria, the exanthemata, grip, pneumonia, erysipelas, and typhoid fever. The toxins of the organism causing the disease are responsible for the nerve lesions far more often than is the organism itself. Lead, phosphorus, arsenic, and alcohol as possible causes are to be kept in mind. Lead in children is a very unusual cause. Arsenic, phosphorus, and alcohol, however, are drugs used extensively during child life and should always be considered as possible etiologic factors. Instances will be found in pediatric literature in which all these substances have been the means of causing multiple neuritis. I recently saw two pronounced cases in two brothers following very severe scarlet fever. Many mild cases of neuritis in children, following exhaustive diseases with prolonged toxemia, are doubtless overlooked, the prolonged time required for the return of muscle power in the arms and legs after disease being attributed solely to muscle weakness.

Diphtheria.—Every child with diphtheria should be watched and treated as if diphtheric paralysis were expected. It has occurred to some extent in 9 per cent. of my cases.

In paralysis following diphtheria the muscles of deglutition take precedence. There may be paralysis of the pharynx and larynx. Infrequently, the muscles of the extremities are affected. It is my experience that if the heart is to be attacked, signs indicating heart weakness will appear early—soon after the paralysis of other parts is apparent, or perhaps as an earlier symptom. The first warning is the heart's irregularity, and this may be the only evidence of its involvement.

Pathology.—The nerves affected may show both interstitial and parenchymatous changes. Early in the disease there is a congestion of

the nerve-sheaths, and multiple hemorrhages have been found in them. Later in the disease the nerves undergo the changes peculiar to degeneration in nerve structures.

Distribution of the Lesion.—A peculiarity of the lesion is that the further away the peripheral nerve structure is from the parent cell, the greater is the susceptibility of the nerve to the influence of the toxic agent. The anterior tibial group, the soft palate, and the muscles of deglutition are most frequently involved.

Sensory Effects.—Sensory disturbances in children are not such prominent symptoms as the neurologist would have us believe, for the reason, possibly, that he usually sees only the more severe cases. The mild cases seldom come under his care. I have seen quite a number of the mild cases in which there were sensory disturbances and a diminished patellar reflex following lobar pneumonia with high temperature, and also after severe scarlet fever.

Symptoms.—The symptoms are variable, depending upon the parts particularly involved. If the extremities or the neck muscles are affected, a careful observer will notice a gradual loss of power. The head is held erect with difficulty. The child is timid and refuses to walk. Usually there are a few falls which occasion the timidity. The child, if old enough, complains of weakness in the legs. In some cases there is nothing more than a limp to indicate the disease. Pain may be present, but has been of unusual occurrence in my cases. The reflexes may be diminished or absent. The characteristic foot-drop and wrist-drop are present in severe cases.

Cases following diphtheria are particularly prone to paralysis of the muscles of deglutition. The child attempts to swallow, and the food returns through the nose. Deglutition may be interfered with to the point of impossibility of swallowing. I have seen several of these cases. The child may not be able to walk or sit upright, or even to support the head. The indication of heart involvement will be an irregularity in its action. Cases in which the heart has been very rapid or very slow have been reported by other observers. In my cases the heart has not been particularly rapid, neither has it been slow. It is irregular in that for ten seconds there may be 10 beats and during the next ten seconds perhaps twice this number. Pronounced irregularity may continue for two or three weeks.

Illustrative Cases.—A boy six years of age had a very mild attack of diphtheria, not of sufficient severity (in the opinion of his physician) to necessitate his remaining in bed. Two weeks after the onset of the attack, at which period he came under my care, there was marked paralysis of the soft palate and pharynx which rendered swallowing most difficult. In spite of energetic treatment with strychnin hypodermatically, the paralysis soon involved the larynx, the masseters, and the muscles of all the extremities. Fortunately neither the heart nor the diaphragm was involved. There was a constant flow of saliva, which at times entered the trachea unimpeded, causing severe paroxysms of coughing. In order to prevent this, the legs and trunk were elevated, the head being made the most dependent portion of the body. Swallowing was impossible, and the patient was given by gavage, every six hours, completely peptonized milk, whisky, beaten egg, and strychnin. The boy made a complete recovery, but required three months to accomplish it.

In the case of another patient, fifteen months of age, gavage was practised at six-hour intervals for five days before food could be swallowed.

Prognosis.—Complete recovery is the rule if there is no cardiac or respiratory involvement, although several weeks or months may be required to bring about complete recovery.

Few cases of diphtheric origin recover completely under eight weeks.

Cases showing only a slight degree of heart involvement are never free from danger.

Illustrative Case.—A girl, four years, apparently well, was admitted to my hospital service with post-diphtheric paralysis of both legs, sufficient to prevent walking. The child, while resting on her back, dropped a top to the floor. She turned over and attempted to reach to the floor for the top and expired. The heart had previously shown some irregularity, and the child had been placed under close observation, which was momentarily withdrawn.

Diagnosis.—The diagnosis is readily made through the multiple symmetric distribution of the paralysis, the impairment of or complete loss of function without impairment of sensation, and finally the disturbed respiration and cardiac irregularity.

Electric Reaction.—The electric reactions are exceedingly variable, depending on the degree of degeneration in the nerves and on the variations in this process during the progress of a case. Early in the disease both galvanic and faradic irritability may be increased. Faradic responses then diminish, and though galvanic excitability is usually increased temporarily, there is ultimately a more or less complete reaction of degeneration. Only in the most severe cases, however, is the galvanic response completely lost.

Treatment.—*General Measures.*—The management is largely palliative, as there is a strong tendency to spontaneous recovery in four to eight weeks from the onset. In cases due to the use of alcohol or some other drug, the elimination of the exciting cause will usually be followed by recovery. In those cases due to the toxemia of preceding disease, time and good care are usually all that will be required to effect a cure. If pain is present, the best means of relief is afforded by heat. The affected limb may be bound in thick layers of cotton-wool.

Drugs.—Salicylate of soda and iodid of potash are not to be given to young children. They produce no appreciable effect, except possibly a disturbance of digestion and a lessening of the appetite. Should the pain be sufficient to interfere with sleep, bromid of soda may be given in doses of 8 to 12 grains for a child of five to ten years of age. This is best given at bedtime and should be repeated but once. In using hypnotics for children, one drug should not be continued longer than three days.

Codein is a satisfactory sedative for a child in case the bromid does not suffice. Between the fifth and tenth years, from $\frac{1}{10}$ to $\frac{1}{6}$ grain of codein may be given at bedtime and repeated once after an interval of three hours.

As a tonic for a patient from five to ten years of age I know of no better combination of drugs than the following:

℞. Strychninæ sulphatis . . . . . gr. ¼
Extracti ferri pomati . . . . . gr. x
Quininæ bisulphatis . . . . . ʒj
M. div. et ft. capsulæ no. xxx.
Sig.—One after each meal.

If constipation is present or should result from the administration of iron, from ⅓ to ½ grain of extract of cascara may be added to each capsule. The capsules are to be given for ten days, followed by cod-liver oil for five days. The oil should be given after meals. At the end of the five days the tonic capsules are to be repeated, and in due time followed again by the oil. This method may be followed as long as is thought necessary.

Convalescence.—The patient should have the benefit of an outdoor life as early as possible. Electricity has not been necessary in my cases, nor has the use of orthopedic appliances been required. Massage may be used with advantage after subsidence of the acute symptoms. It should be given by one skilled in the work.

Treatment of Multiple Neuritis after Diphtheria.—Cases following diphtheria require particular mention, because of the danger of involvement of the heart, muscles of deglutition, and of respiration. If, after ten days from the onset of throat paralysis or paralysis elsewhere, there is no evidence of cardiac involvement, it will probably not develop later, although this is by no means certain.

Rest.—Should the heart become involved, absolute rest in the recumbent position is important. The patient should be constantly under the eye of an attendant and should not be allowed to turn over in bed or to raise his head without assistance.

Medication.—A hypodermic syringe loaded with $\frac{1}{100}$ grain of strychnin should be in readiness throughout the entire illness and well on into convalescence. Camphor in the dose of 1½ grains in capsule may be kept at the bedside.

In these cases we rarely have to deal with children under eighteen months of age,* so that in the consideration of doses only children over one year of age will be referred to. To a child from one to two years old, $\frac{1}{300}$ grain of strychnin may be given at three-hour intervals; from two to four years of age, from $\frac{1}{200}$ to $\frac{1}{150}$ grain at three-hour intervals. After the fourth year, $\frac{1}{150}$ to $\frac{1}{100}$ grain may be given at three-hour intervals. When there is marked rapidity of the heart's action, with irregularity and restlessness in those under three years of age, from one or two drops of tincture of strophanthus may be given with $\frac{1}{15}$ to $\frac{1}{10}$ grain of codein, and repeated at two-hour intervals. After this age, one and one-half to three drops may be given with $\frac{1}{10}$ to $\frac{1}{6}$ grain of codein at two-hour intervals. The codein is to be discontinued as soon as the restlessness ceases. For those in whom there is simply paralysis of the muscles of deglutition or of the extremities, small doses of strychinin will be all the medication required, from $\frac{1}{300}$ to $\frac{1}{200}$ grain three times daily being sufficient.

Gavage.—Troublesome features in the management of cases in which there is marked involvement of the muscles of deglutition, and the palate, pharynx, and larynx, consist in the difficulty in feeding the patient and in the danger of his aspirating food and mucus as a result of paralysis. For such patients gavage (p. 758) may be used with much benefit.

* My youngest patient with diphtheric paralysis was fifteen months old.

From 6 to 10 ounces of food may be introduced into the stomach at four- to six-hour intervals. In using the so-called forced feedings, it is well to give as large feedings at one time as possible, as the process is always resisted by the patient. In the cases in which the aspiration of fluids and mucus into the larynx is a troublesome or dangerous feature, the trunk should be elevated and the head lowered.

FACIAL PARALYSIS

Paralysis of the facial nerve is not of infrequent occurrence in the young. It may result from forceps pressure at birth or from pressure exerted by the bony parts of the pelvic outlet. In later infancy or childhood it may be the result of trauma caused by operative manipulations, it may be of rheumatic origin, it may be due to cerebellar disease, or to exposure to cold. In one of my patients the paralysis was attributed to sitting by an open window in a railroad car on a cold day. The nerve, in its outward passage through the Fallopian canal, may become diseased from the presence of a purulent otitis media. This is probably the most frequent cause of facial paralysis.

Prognosis.—The prognosis depends largely upon the cause of the paralysis. Cases due to exposure to cold, and rheumatism, and those in the newly born that are due to birth trauma usually terminate in recovery.

Cases resulting from section of, or other injury of the nerve, through accident at operation, likewise almost always have a satisfactory outcome. The unfavorable cases are those due to brain disease, such as meningitis or tumor, or to severe injury, such as fracture or caries of the temporal bone.

Treatment.—The management depends entirely upon the cause of the paralysis. If the condition is due to cerebral disease, but little is to be expected from treatment. If it is due to an otitis media, surgical procedures, such as establishing a free drainage from the cavity of the middle ear, followed by frequent hot irrigations, should be employed. If these are ineffective, the mastoid should be opened and the cavity drained posteriorly. When the functional activity of the nerve is delayed, electricity may be brought into use in the manner indicated below. Cases in which rheumatism is supposed to be a factor should be given the benefit of antirheumatic treatment by the use of the salicylates (p. 689). In the cases due to cold or trauma there is a strong tendency toward recovery without treatment.

It is difficult to judge of the value of such a therapeutic measure as electricity; but the effect of exercising the paralyzed muscles and stimulating nerve conduction by its use must be of some service. If the electricity is used, five-minute daily sittings are all that are necessary. The faradic current should be employed if it produces sufficient reaction; if not, the interrupted galvanic current.

ERB'S PALSY (OBSTETRIC PARALYSIS)

This disease is due to a traumatic neuritis caused by an injury of the brachial plexus during labor.

Lesion.—The injury may be very slight, causing but a temporary paralysis, or very extensive, causing subsequent degeneration of the nerve structure. The essential lesion in Erb's palsy is an injury of the fifth and sixth cervical nerve-roots near their junction on emergence from the spinal cord. This injury may involve rupture, laceration, or bruising of the nerves, and occasionally hemorrhage between the fibers. In typical cases the seventh and eighth cervical nerves are not injured, but occasionally these also may be damaged. The muscles principally affected by the paralysis are the deltoid, biceps, brachialis anticus, supinator longus and supinator brevis, the spinati, and coracobrachialis. The pectorals, latissimus dorsi, and triceps may be partially affected.

Diagnosis.—The chief point in the diagnosis is that one arm alone is involved. Cases of bilateral involvement are extremely rare. In differentiating this form of paralysis from cerebral palsies it will be noted that there is a flaccid paralysis with some degree of atrophy. There is never spasticity, and the mentality is normal. After a few months the affected limb becomes smaller and much softer than the unaffected arm. Owing to the location of the muscles involved and because of the paralysis of the supinator group, the arm is often rotated inward, throwing the palm of the hand outward and backward. Owing to paralysis of the extensors, due to involvement of the musculospiral nerve, the fingers and thumb are in a more or less permanent condition of flexion-fixation.

Prognosis.— In the main the prognosis is favorable, but not as favorable, from my observation, as the literature would lead us to believe. In fact, a guarded prognosis should always be given. I have seen complete recoveries. A case involving fracture of the humerus with complete paralysis underwent complete recovery in three months. I have seen partial recoveries in other instances, and again other cases in which the lesion was of such a nature as to make recovery impossible. We may safely say that all the subjects improve and that they may recover entirely, but we are not in a position to promise any outcome in a given case. Improvement should not be despaired of even after several months have elapsed. I have known cases in which the improvement continued to the eighth and tenth year. In a few cases the paralysis and deformity are permanent.

Sachs states that even in the event of complete paralysis, recovery may be looked for in the cases showing a slight response to faradism, in two or three months. When there is no faradic response, but reaction to the galvanic current, the restoration of power may be expected in six months. In those cases in which there is no galvanic or faradic response, a year or two may be required before the arm is normal.

Treatment.—The atrophy and contractions which develop are determined largely by the extent of the injury, and to a lesser degree by the treatment. During the first three weeks in lifting and handling the infant the arm should be protected from other injuries, such as may take place in bathing and the other manipulation necessary in the care of the baby. After this time massage of the entire arm and shoulder with lanolin should be practised at least twice a day, from ten to fifteen min-

utes at a time. After two weeks electricity may be used for a few minutes each day. If the child can bear it, the faradic current answers best. In case, however, there is no response to faradism, the galvanic current should be used. Under massage and electricity the improvement in the arm is often most satisfactory. It is not well, however, to promise the parents that a normal arm will be the outcome. I have seen cases in which there was complete restoration of power after it had been entirely lost, while in others the arm was permanently disabled. The degree of improvement is dependent upon several factors, the chief one of which (the extent of the nerve injury) is in every case uncertain.

Operative measures, consisting of grafting and transplanting of the nerve, have recently been advocated by many surgeons. Such procedure would seem worthy of trial when it is demonstrated that the patient has made all the improvement probable with other treatment.

An important feature in the management of these cases consists in the prevention of deformity through contractures. This may be accomplished by the use of suitable orthopedic appliances.

The value of manipulation treatment and electricity is difficult to determine. Dispensary cases in which no treatment of moment was carried out have made very satisfactory progress, providing contractures and deformities were not allowed to develop.

FRIEDREICH'S ATAXIA (HEREDITARY ATAXIA)

The name of the disease which I am about to describe is an illustration of our faulty nomenclature. The name of a disease should signify some characteristic of the disease. Friedreich was the first to describe this affection and establish a clinical entity, hence it is known by his name. The other designation, "hereditary ataxia," is faulty for the reason that heredity does not necessarily enter into consideration. Two brothers, whom I saw a few years ago, aged four and six years, developed the disease in a family in which the family history was otherwise perfect. This disease, however, shows a tendency to family selection. Gowers refers to 65 cases occurring in 19 families. The number of cases in one family was as high as 10. Gowers finds the sexes about equally divided as regards liability. Sachs, in a wide experience, has never seen a case in a girl.

Pathology.—Neurologists agree that the pathology of Friedreich's disease is not well understood. Sachs states that "one fact is indisputable, in microscopic examinations a sclerosis of the spinal cord is found involving at different levels or at one and the same levels various systems of the cord. The sclerosis affects most frequently the posterior columns or the lateral columns or both together, and hence the symptoms vary between those of a pure posterior spinal sclerosis and those due to a posterior lateral sclerosis, resembling the symptoms of the ataxic paraplegia of the adult."

Symptoms.—Walking is early interfered with, and the child stands with difficulty. The gait is peculiarly ataxic. The feet are placed widely apart, and the patient's attempts at locomotion are attended

with uncertainty and hesitancy. Romberg's symptom was present in the two boys referred to. Neurologists tell us that this symptom is variable.

Incoördination in the use of the arms is present, not unlike that in chorea. Attempts at a concise volitional act with the upper extremities —such as writing, bringing the ends of the index-fingers together, or placing the tips of the fingers on the tip of the nose—result in hesitancy, tremor, and imperfection in the act attempted. In fact, the act can be accomplished only with much effort and after several attempts, if at all.

Sensation is not greatly interfered with.

As the disease progresses choreic movements of the head and face develop. The Babinski reflex is usually present. The patellar reflex is lost. There is gradual loss of muscle power and later emaciation.

The patient is mentally slow and diffident. There is an entire loss of confidence, and this is stamped on the countenance and is manifested in every voluntary act. The child hesitates and speaks slowly, as though ideas were hard to formulate into words.

The eye changes are not important. Nerve atrophy does not occur, and the Argyll Robertson pupil is absent.

Prognosis.—The disease is slowly progressive and fatal, although several years may be required before the fatal termination, which is usually the result of intercurrent disease. The duration of the ataxia is rarely longer than ten years. The patient may succumb before the fifth year.

Differential Diagnosis.—True tabes may be differentiated from Friedreich's ataxia by the absence of mental impairment and spinal defects, both of which conditions belong to Friedreich's disease. The Argyll Robertson pupil is present in tabes and absent in Friedreich's ataxia. Choreic movements of the upper extremities are the rule in Friedreich's disease and absent usually in tabes.

Treatment.—No known form of medication is of value. All that may be accomplished in the treatment relates to the comfort of the patient.

ACUTE SIMPLE MENINGITIS

Acute meningitis, as its name implies, is an acute inflammation of the meninges covering the brain.

Etiology.—Acute meningitis may be either a primary or a secondary disease. The more common sources of acute meningitis are suppuration in the ears, nose, and eyes, head injuries, and systemic infections with a bacteremia such as typhoid, influenza, pneumonia, and infective endocarditis.

When primary, meningitis is usually due to the influenza bacillus or the pneumococcus. Cases due to such causes are not at all unusual in hospital work.

Cases of secondary origin are usually the result of the invasion of the staphylococcus. The streptococcus, colon bacillus, and typhoid bacillus may also be included in the latter group, the cerebral involve-

ment following pneumonia, or an intestinal infection or typhoid fever. Streptococcus or staphylococcus meningitis is often a complication of middle ear, mastoid, or sinus disease.

Pathology.—The changes occurring locally in and about the brain depend on the character and source of the infection. In ear infections the lesions are often unilateral and accompanied by a sinus thrombosis. In the majority of the other cases the vessels of the pia are congested and are the site of small hemorrhages, and the surface of the brain is covered with seropurulent fluid and patches of fibrinous exudate; the convolutions are flattened to a degree depending on the amount of associated hydrocephalus. Accompanying cord-involvement is the rule. The presence of a large amount of greenish-yellow exudate over the upper portion of the brain, with many adhesions is very characteristic of pneumococcus meningitis. In certain infective fevers, such as measles and scarlet fever, acute serous meningitis may occur.

In my most recent case due to the pneumococcus the anterior half of the brain (see Plate I) was incased in pus.

Symptoms.—If the case is primary and due to the pneumococcus or influenza bacillus, the onset may be sudden, with vomiting and convulsions, both of which may be repeated many times. With the active manifestations there will be at first drowsiness, followed by stupor from which the child can with difficulty be aroused. Usually the active symptoms, such as vomiting and convulsions, are absent in the secondary cases.

The first indication of cerebral involvement will be drowsiness, stupor, irregular respiration, and irregular pulse. *A disturbance of the heart action is a very significant and early sign.* It may be irregular, intermittent, or it may be very rapid and regular. I have repeatedly seen the heart action at 140 to 180 a minute, with practically a normal temperature. A tense fontanel is rarely absent, and is one of our most valuable signs. The pupils are usually dilated symmetrically or unevenly, and show little or no response to light. Hyperesthesia and rigidity of the neck may be present.

Purposeless movements of the leg or arm are often seen when the symptoms of the disease are well marked. The leg or arm is raised and allowed to fall; this is repeated for hours at a time. An elevation of temperature is usually present. It may be high, low, or variable. Swallowing is early interfered with.

In the patient above referred to, whose brain is shown in Plate I, the first sign was a temperature of 102° F., a greatly distended fontanel, and stupor. The child died in three days, aged seven months.

Diagnosis.—There is no characteristic temperature range. The only positive information as to the nature of the infection is obtained by lumbar puncture; only in this way can a positive differential diagnosis between acute simple, tuberculous, and cerebrospinal meningitis be made.

In many severe diseases in which there is marked toxemia, symptoms closely resembling meningitis will be in evidence. In pneumonia, in

Pneumococcus meningitis.

the severe intestinal infections, and in heat prostration the cerebral symptoms so closely simulate those of meningitis that a positive diagnosis without lumbar puncture may be impossible. Before the advent of lumbar puncture I have seen most excellent clinicians diagnose meningitis in cases which at autopsy showed no pathologic condition in the brain. I have further known cases so diagnosed to recover too promptly to be a comfort to the attending physician.

Differential Diagnosis.—An examination of the cerebrospinal fluid is always to be carried out if possible. In acute simple meningitis the fluid is usually turbid, and when allowed to stand, a considerable deposit forms in the tube, an examination of which determines the nature of the infection. Cases of simple toxic origin simulating meningitis show the signs of drowsiness, stupor, and perhaps hyperesthesia and immobility of the pupils, but no irregularity of the pupils and rarely irregular respiration and distention of the fontanel. Particularly significant in such cases is the absence of signs of irregularity and slowness in the heart action.

Prognosis.—The prognosis is most unfavorable. I have yet to see recovery in a case in which the diagnosis was proved by lumbar puncture. Occasionally such recoveries are reported.

Treatment.—The most one can do in acute simple meningitis is to nourish the patient and lessen his discomfort. We have no means of treatment that may be considered in any sense curative. By the use of repeated lumbar puncture we can in some cases make the patient more comfortable, and perhaps aid him to resist the infection. The pulse and the respiration improve, as well as the urgency of the nervous phenomena; the opisthotonos and the excessive hyperesthesia may be temporarily relieved. There is no rational ground, however, for expecting the withdrawal of the cerebrospinal fluid to be curative; nor may the injection of disinfectant drugs into the canal be expected to aid in controlling the disease.

Lumbar Puncture.—Lumbar puncture (p. 547) may be practised as frequently as once in twenty-four hours, the frequency of such procedure depending, of course, upon the condition of the patient and the relief afforded. The use of lumbar puncture more frequently than once in twenty-four hours, as has been suggested by some writers, is not, however, to be advised. The amount of fluid to be withdrawn depends upon the pressure in the canal as indicated by the passage of fluid through the cannula, from one to three ounces being the usual amount withdrawn. The usual surgical precautions as regards asepsis should be observed in performing the operation. One dram of aristol in one ounce of collodion, applied with a camel's-hair brush, makes a suitable protective dressing after the withdrawal of the cannula.

Warm Packs.—The warm pack or warm bath at 105° F., by lessening the cerebral blood-pressure, may also assist in relieving the more active nervous manifestations. If the bath is used, the child should not be kept in it longer than three minutes. I usually prefer the hot pack. A large bath-towel or medium-weight flannel sheet is wrung out of water

at 110° F. and wrapped around the child's body from the waist down. This is repeated at half-hour intervals for three hours, when, after a period of rest for an hour or two, the packs may be resumed.

Diet.—The proper nutrition of the patient with meningitis is often a matter of no little difficulty. The child may either refuse the food, or be unable to swallow. Nutrition by means of the rectum or colon may be of assistance for a few days, but cannot be relied upon for long periods for the reason that the parts become intolerant and the nutrient enemata are expelled. Feeding by means of gavage is always to be employed when other means fail. The younger the child, the more applicable this method. The feeding should not be attempted oftener than at four-hour intervals; usually, feeding every six hours suffices. Completely peptonized full milk (p. 80) is usually given in quantities suitable for the age. After a few trials of gavage the patient may take the nourishment by the usual method, or the gavage may be kept up indefinitely.

Sedatives.—Sedatives may be employed with a view to saving the strength of the patient. Morphin, codein, the bromid of soda, or chloral may be given. As morphin and codein increase the usual existing constipation, their use should be very temporary. The bromid of soda for the cases which may require the protracted administration of a sedative answers better than any other form of medication. To an infant under eighteen months of age, from 2 to 4 grains may be given at intervals of two to three hours, according to the results. In case the nervous symptoms are very urgent, ½ to 1 grain of chloral may be added. Should administration by mouth be impracticable, the sedative may be given by rectum, by means of a rectal tube inserted at least 9 inches. In using the bromid and chloral in this way twice the amount of chloral and thrice the amount of bromid employed in stomach administration should be given. After the eighteenth month, from 1 to 2 grains of chloral and from 4 to 8 grains of the bromid well diluted may be given by the stomach, and repeated as often as may be necessary. In case the medicine is to be given by rectum, it should be diluted with at least 4 ounces of water, and proportionately more given, as suggested for younger children.

TUBERCULOUS MENINGITIS

Tuberculous meningitis is one of the most fatal diseases of childhood. As its name implies, it is a tuberculous inflammation of the meninges. The frequency of the disease is due to the favorable field offered by the covering of the brain for bacterial growth and the wide dissemination of the tubercle bacillus. The rapid development of the brain, the birth weight of which is increased about four times, during the first four years of life, necessitates rapid development and active work on the part of the blood-vessels and lymphatics. These, therefore, supply a favorable culture field for the invading organism.

Age.—No age is exempt. My youngest patient was three months old. Between the first and third year the greatest number of cases

occur. The disease is rare after the eighth year. I have seen four cases between the twelfth and the eighteenth year.

Pathology.—This form of meningitis is usually secondary to tuberculosis elsewhere in the body, and is very commonly part of a general miliary infection. Out of 413 fatal cases of tuberculosis in children, Shennan reports tuberculous meningitis in 184, or 44.5 per cent. In 77 of these cases the disease had spread from mediastinal glands; in 26, from abdominal glands; and in a small number, from an active pulmonary inflammation. Transmission may occur either by the blood or lymph-channels. The brain is the seat of a tuberculous inflammation which begins in the walls of the small blood-vessels and terminates in the formation of multiple, small, focal lesions and a turbid, fluid exudate. The tubercles are most abundant in the ependyma, but are also numerous on the pia, especially in the neighborhood of the larger fissures and about the base of the cerebellum. The cerebral convolutions are flattened, and the ventricles are dilated with a turbid, watery content, this fact readily accounting for the familiar pressure symptoms of the disease.

Symptomatology.—Tuberculous meningitis is variable in its early manifestations. Probably one of the earliest indications of the disease is a change in the disposition of the patient. A happy, easily pleased child becomes cross and disagreeable, and may remain for days in this condition. In getting the history of a case I have repeatedly heard these symptoms brought forward.

Illustrative Cases.—A girl patient, three years of age, was in the habit of going to the park daily. On her return home, regardless of the street selected by the nurse, the child insisted on turning back and passing through another street. The child was very irritable and refused to play with other children. The mother had been in the habit of singing several songs to the child. The child selected one and would have no other. She was not content out of the mother's arms, and insisted that the song constantly be sung to her while awake. The mother became nearly distracted at the constant performances, and at this time, after three weeks of decided mental aberration on the part of the child, brought her under my care. The child died five weeks later from tuberculous meningitis.

Two cases have recently come under my observation in which the first symptom and the only symptom for two weeks was intense headache.

There may be vomiting without apparent cause, and if the vomiting is repeated one or more times on successive days and associated with other suggestive signs, it constitutes a symptom of no little value.

Convulsions may usher in the disease. The convulsions are apt to be repeated several times.

Mental disturbance, vomiting without apparent cause, convulsions, loss of appetite, constipation, restlessness at night, and night-cries belong to the earlier manifestations. After a week or perhaps two weeks of pronounced though indefinite signs the child becomes dull and apathetic, sleeps a great deal, and rapidly passes into a condition of semi-stupor from which he is aroused with difficulty. Hyperesthesia and exaggerated reflexes may be present early in the disease. With the progress of the case they often disappear. The fontanel early becomes tense and bulging—a very valuable sign.

Decided evidences of cerebral pressure now make their appearance. The respiration becomes irregular. The pulse-rate is 60 to 80 instead of 100 to 120. At times the pulse will change very markedly and become rapid for a few hours; as a rule, it is characterized by slowness and irregularity. Rigidity of the neck, slight opisthotonos, and spasticity of the extremities appear. During this time the child will usually swallow if food is given. In many cases there is an incoördinate, almost perpetual motion of the arm and leg on one side of the body. The pupils become sluggish, responding slowly to light stimulation, or fail to show any response. The pupils may be unequal. One pupil may respond to light while the other remains stationary.

There is no characteristic temperature in tuberculous meningitis. The usual range is between 99° and 102° F. It may be higher or lower.

Very few cases of uncomplicated tuberculous meningitis occur, as mentioned before. The meningitis is usually associated with tuberculous processes elsewhere, which exert a controlling influence on the temperature.

Later Symptoms.—The coma increases. It is impossible to arouse the child. Liquid food placed in the mouth remains there or runs out at the sides. The breathing is labored. The pulse becomes slower and intermittent and irregular, and the child dies.

Regardless of the age, the signs and symptoms are very similar.

Occasionally one meets with fulminating cases with sudden onset with urgent symptoms of vomiting, high fever, rapidly developing stupor, and irregular pulse and respiration. Such cases are rare, and when they occur, are easily confused with those of cerebrospinal meningitis.

Diagnosis.—Early positive diagnosis is impossible unless the case is a very active one. With the development of pressure signs, certain phenomena appear which point very strongly to the nature of the disease.

Rigidity of the neck is usually present in some degree. When the child's head is raised from the pillow, the entire body may be elevated accordingly.

Fulness of the fontanel (in case the fontanel has not become closed) is always present in greater or less degree, and is a sign of much value.

Slow, irregular pulse, and slow, uneven respiration are symptoms of great diagnostic value. Rarely does a case pass through its various phases without showing these phenomena.

Drowsiness, gradually increasing, followed by stupor and coma, is a constant manifestation.

Unequal, inactive, usually dilated pupils will be found in cases well advanced.

Repeated vomiting without apparent cause, in the presence of suggestive signs, supplies valuable corroborative evidence.

The *Kernig sign* consists of an inability to extend the leg on the thigh when the thigh is flexed on the abdomen. This symptom is present in nearly all cases late in the disease.

The Babinski reflex and Oppenheim's reflex, about which much is

written, are of very little value; if present, they corroborate other findings. Their absence means nothing. True, they may be present in a certain proportion of cases of tuberculous meningitis, but they are present in tetany and so-called tetanoid states from whatever cause, and they may also be present in brain injury and in spastic paraplegia due to birth trauma.

The temperature range is of no value in diagnosis for reasons already given. Optic neuritis is present in a majority of the cases late in the disease. Tubercles in the choroid will be found in most cases.

Lumbar Puncture.—A positive diagnosis can be made only by lumbar puncture (p. 547). Tubercle bacilli will be found in the spinal fluid in practically all cases of tuberculous meningitis, although it may be necessary to make more than one examination. In withdrawing the fluid, that which is drawn last should be collected for the examination. The test-tube, in which 10 to 15 c.c. of fluid has been drawn, should then be allowed to rest at room-temperature for twelve to eighteen hours, when a delicate clot of fibrin will have formed in the fluid. The fibrin may then be removed and examined by the usual methods for the detection of tubercle bacilli.

In one case occurring under my care the tubercle bacilli were not found until the tenth examination was made. The child had all the usual symptoms of meningitis, and there were tubercle bacilli in the bronchial secretion; the examinations were, therefore, persisted in.

The Spinal Fluid.—The appearance of the fluid withdrawn is suggestive, being bright and clear or slightly opalescent in tuberculous meningitis, while in other forms it is usually turbid and cloudy.

Differential Diagnosis.—The first problem in a given case is to decide whether there is a meningitis and whether the signs are such as to warrant further investigation. Such being the case, a differentiation as to the type we are dealing with is necessary, and here again lumbar puncture must be brought into use. While we may, with a considerable degree of accuracy, judge as to the nature of the infection, cases are frequently encountered in which a differentiation is impossible without lumbar puncture.

Acute simple meningitis may closely resemble that due to the meningococcus (cerebrospinal), particularly if the influenza bacillus or the pneumococcus is the infecting agent.

We may have a very active condition due to the tubercle bacillus which may be readily confused clinically with meningitis of the cerebrospinal type. Again, I have seen several proved cases of mild cerebrospinal meningitis which surely would have been diagnosed as tuberculous without the proof supplied by the lumbar puncture.

The most frequent error made is in the cases of grave systemic poisoning with active cerebral manifestations. In pneumonia, scarlet fever, heat prostration, and in the acute intestinal infections, the stupor, the convulsions, and vomiting often are interpreted as due to meningeal involvement. In toxic cases of such a nature the evidence supplied by the absence of the distended fontanel, the absence of eye symptoms, and

the absence of the respiratory and pulse phenomena point strongly to a meningismus and not to a meningitis. It must be remembered that any cardinal symptom of meningitis may be present in one of these acute toxic processes. In meningitis, however, we have a grouping of symptoms—a symptom-complex which renders a diagnosis practically positive.

Prognosis.—The prognosis is most unfavorable. I have seen a large number of cases, both in hospital and private work, and have never known a recovery of a proved case. Recoveries have been reported, however, by competent observers.

Archanzelsky, of Moscow, reports the recovery of a girl eight years of age who showed the characteristic symptoms of the disease, and in whose cerebrospinal fluid a large number of tubercle bacilli were found. This writer found in the literature instances of recovery in 50 cases of tuberculous meningitis the existence of which he considered proved.

Duration.—The duration of the disease varies. Few cases pass the third week. I have seen patients die within one week after a positive diagnosis was made. My longest case was in a girl three years old, who lived six weeks from the onset of the symptoms.

Treatment.—I know of no treatment that is of curative value. For the comfort of the family and the relief of symptoms the measures suggested under the treatment of simple meningitis (p. 531) may be followed out.

Withdrawal of the cerebrospinal fluid, removing the pressure within the cranium, may furnish temporary relief from the very active symptoms of convulsions, restlessness, and muscle contractions. The fluid returns, however, and the fontanel, which was sunken after the tapping, is soon bulging as much as before. The therapeutic value of the lumbar puncture, according to my observation, is nil.

CEREBROSPINAL MENINGITIS

In 1866 Samuel Webber recorded over a score of epidemics occurring between the fourteenth and nineteenth centuries, which presented the features of this form of meningitis, giving rise to such designations as "typhus syncopalis," "petechial fever," "fièvre cérébrale," and "céphalogie épidémique."

Danielson and Mann describe an epidemic which attacked Massachusetts in 1806, and in 1811 Elisha Hirth published a very full account of "a malignant epidemic called 'spotted fever.'" Since this period, according to Dr. A. Jacobi, outbreaks of the disease have been more extensive in America than in any other country. In the years 1904 and 1905 New York city underwent a very severe epidemic, which caused about 3400 deaths, and in the winter of 1904 attained a mortality of 91 per cent. At this time a commission appointed to investigate the disease reported the presence of the meningococcus, as shown by cultures from the nasal mucosa, in 50 per cent. of the patients and in 10 per cent. of their attendants. This organism, also known as the Diplococcus intracellularis of Weichselbaum, was discovered in 1887. Heubner

first showed the existence of the same agent in the spinal fluid of a living patient.

The extreme irregularity remarked by many observers in the spread of epidemic meningitis has led one to state that "from the practical clinical standpoint the etiology is about the same as for death by lightning." In the past the mortality has ranged from 50 to 100 per cent. With the adoption of serum therapy, however, the death-rate has been universally lowered, and in 1908 Flexner and Jobling were able to report a total of nearly 400 cases in which their serum had been used, with a mortality of only 25 per cent., while in the cases most promptly treated the death-rate was considerably lower.

Etiology.—Cerebrospinal meningitis occurs sporadically and in epidemic form. The disease is due to the Diplococcus intracellularis of Weichselbaum, which has become known as the Meningococcus intracellularis, and is universally acknowledged as the infecting agent in the disease.

This organism has been found in the blood, lungs, and joints. It has never been demonstrated as existing outside of the body.

Pathology.—Notwithstanding the general nature of this disease, as shown by its fulminant course and the existence of such symptoms as petechiæ, purpura, and herpes, the lesions produced are quite closely limited to the central nervous system. Here the conditions found in cases of simple meningitis are roughly simulated. Enlargement of the spleen, multiple abscesses, acute nephritis, hepatic degeneration, and pneumonia may also be found.

The exudate covering the brain is usually lighter in color and thinner than in pneumococcous meningitis and in sporadic cases of the meningococcus type. The cord and base of the brain only, or even the cord alone, may show the presence of the lesions. The affected portions of the brain are covered with the seropurulent or purulent fluid and patches of fibrinous exudate, and the cerebral convolutions are more or less flattened, depending on the degree of accompanying hydrocephalus. This last condition is most marked in the posterior basic inflammations, in which the foramina of the ventricles are occluded. In very malignant cases there may be no postmortem evidences but those of an acute toxemia. (Sporadic cases, correctly identified neurologically and anatomically, have been unnecessarily classified clinically under the term "posterior basic meningitis.")

The Cerebrospinal Fluid.—The cerebrospinal fluid is turbid. Whether it is greatly increased in amount or not depends upon the severity of the infection.

Transmission.—That the disease may be transmitted from those affected to the well has never been proved, and it cannot positively be placed in the communicable class, although such action has been taken by the New York Health Department. It is extremely rare for two cases to develop in the same family, even when no quarantine is established. I have seen many patients admitted to hospital wards containing other children and have never known a new case to develop under

such conditions. Epidemics occur at different times in different localities without assignable cause. Several children become ill in a given locality, covering perhaps a period of two or three months, and then the disease disappears.

Various theories have been advanced from time to time as to the mode of entrance of the meningococcus into the body. All the cases in a given epidemic are evidently infected from the same source. One of the means of infection is probably through the inspired air. The meningococcus has been found by different observers, as mentioned above, in the mucous membrane of the nose.

Age.—The disease is one of childhood. It may occur in earliest infancy, however, or in extreme old age. From two to ten years appears to be the most susceptible age. Rotch had a patient six days old. Koplik's youngest patient was four months of age.

Symptoms.—In common with all diseases in which the infecting agent is microbic in character, cerebrospinal meningitis may exist in so mild a form that it is not suspected, or it may be sufficiently severe to take the life of the child in a few hours.

Illustrative Cases.—During the epidemic of 1904 and 1905 in New York city, I showed two patients—one a child of nine months, and one a child of four years of age—to my students at the New York Polyclinic Medical School and Hospital. In neither child could the men on the benches discover anything wrong. In the younger child the only symptom was a rather full fontanel and a tendency to drowsiness when left alone. At that time his cerebrospinal fluid contained the meningococcus. The four-year-old child had headache and some photophobia, and was extremely irritable. There had been vomiting, and there was an irregularity in the heart action. This boy sat up, answered questions, and did not appear at all ill. The day previous, meningococcus had been found in the cerebrospinal fluid. Both children recovered without treatment.

Fulminating Cases.—On the other hand, during the same epidemic a girl of eight years was taken ill with the disease in the early morning, and died about 10 o'clock at night on the same day. This very severe form is usually found among the earlier cases in an epidemic. The symptoms of these fulminating cases are from the onset most severe. The child is literally "struck down." The earliest symptom may be a violent chill, followed by fever, or the initial symptom may be a convulsion. If there is a convulsion at this period, the child rarely comes completely out of it. Active vomiting may be present. Extreme irritability usually precedes the comatose state, which rapidly supervenes. Whatever may be the early manifestations in any fulminating case, two symptoms will always be present—intense headache and high fever. The heart action becomes very rapid, breathing is superficial and irregular, the pupils show no response to light, and the child cannot be roused. Rigidity of the neck muscles and general muscle contractions may be present. There is intense hyperesthesia, the slightest sound or touch being acutely felt and resisted. I have seen the child throw himself about during the first hours so that he was with difficulty kept in bed.

Petechiæ appear, and ecchymotic areas soon are scattered over the surface. This symptom, however, does not occur in all cases.

Between the mild and fulminating types of the disease symptoms of

any degree may exist, indicating the varying degrees of virulency of the infection. As a rule, the onset is more abrupt than in other forms of meningitis. *Headache* is a fairly constant symptom in all cases. This will be evidenced by complaint on the part of the child or in younger children by head-rolling or head-boring, or striking the head with the hands.

Position of Patient.—The position of the child when the case is fully developed is characteristic. The patient rests on his side; the head is retracted, the knees are drawn up, and the legs are flexed on the thighs; the arms are flexed and the hands clinched.

The Fontanel.—The distention of the fontanel in the younger patients is a constant and very reliable sign.

The Temperature.—The temperature is variable and irregular—now high, now low; there is no characteristic temperature range in the disease.

Convulsions occur in a majority of the cases. There is always hyperesthesia, and evidence of much discomfort when the child is handled.

Muscle rigidity is usually present, even in the milder cases. The entire body may be involved and become stiff and rigid, or a muscle group only may be involved. Rigidity of the neck and some degree of opisthotonos are rarely absent, except in the milder cases. The feet are held in a position of extension. Swallowing is difficult or impossible, and toward the end, in fatal cases, gavage has to be resorted to. In the recovery cases, also, during the active stages of the disease, this measure may be necessary to sustain the patient.

Heart and Respiration.—The heart action is much disturbed. It may be very rapid or slow. The usual condition is that of slowness and irregularity.

The respiration likewise is slow and irregular, and may assume the Cheyne-Stokes type.

Mental Apathy.—The child becomes extremely dull, and is aroused with difficulty. From this condition he may recover, or, what is more frequently the case, he passes into a condition of stupor and coma.

Bowel Conditions.—The bowels are usually constipated and the abdomen is retracted. These symptoms, made much of by writers, are very variable and may or may not be present in severe cases.

The Eyes.—The eyes frequently show strabismus. The pupils are usually dilated, often unequal in size, and show no response to light, or react but slowly.

The Ears.—Deafness may occur early and continue throughout. In the absence of local ear changes it is due to an inflammatory involvement of the auditory nerve.

The Skin.—In but a few cases seen by me have there been skin changes. Petechiæ and ecchymoses have been seen in the very malignant forms. The skin in the mild and moderately severe cases has remained negative.

Symptoms in Recovery Cases.—In a case in which there has been a moderately severe infection and which goes on to recovery, there is a train of symptoms which indicates the favorable outcome.

As might be expected, a general clearing of the dulled mentality is one of the earliest and most favorable signs. The temperature, which, though variable as to degree, is almost always present, subsides. The child evidences a desire for food, and makes attempts at using his stiffened muscles. Muscle rigidity is the last symptom to disappear. I have repeatedly known children to talk, to play, and be interested in their surroundings; in fact, apparently well, with the exception of the muscle contraction which held them in the characteristic position of opisthotonos.

Illustrative Case.—A child seen at various times in consultation with a colleague was blind for six weeks, absolutely deaf for three months, and on his back for five months, yet made a perfect recovery. Toward the end he was emaciated to a skeleton. I saw the boy on three occasions, and each time made a fatal prognosis. Four months after my last fatal prognosis I saw the boy on the street playing with other boys.

Diagnosis.—Abrupt onset is the rule. Convulsion, vomiting without apparent cause, chill, headache, more or less intense photophobia, hyperesthesia, rigidity of the neck muscles, and fever constitute the earliest diagnostic signs. Such a symptom-complex, followed by drowsiness and stupor, warrants the use of lumbar puncture (p. 547) to determine positively the presence of meningitis. This should be done in all suspected cases so as to give the patient the benefit of the Flexner serum at the earliest possible moment. The later manifestations of the disease are unmistakable. The rigid neck, opisthotonos, the dilated, unequal and immobile pupils, the slow, irregular respiration, and slow, irregular pulse, comprise a group of diagnostic signs found only in meningitis.

Hyperesthesia is always present. The child almost invariably cries when disturbed or handled in any way, while his mentality is still able to appreciate the disturbance.

Kernig's Sign.—This consists in an inability to extend the leg on the thigh when the latter is flexed on the abdomen. The sign is present and is fairly reliable in children over two and one-half years of age. In younger children, particularly those under eighteen months, because of the normal tendency to contraction of the flexor muscles at this period of life, the sign is of less value.

Kernig's sign is also present in other cerebral lesions and in other forms of meningitis.

Babinski's phenomenon consists in an extension of the great toe and a flexion and separation of the remaining toes when the plantar surface of the foot is stroked with the finger. This sign is often absent, and is of corroborative value only in the event of other symptoms. Its presence may be an indication of meningitis, and its absence is of no significance. I have produced this reflex repeatedly in normal children under eighteen months of age.

The *tache cérébrale* may be demonstrated in practically every case.

The *patellar reflex* is variable and uncertain. It may be increased, diminished, or absent, and is of little diagnostic value.

The Eye Changes.—The pupils are usually dilated, often unequal, and may show no response to light or react slowly.

Strabismus is always present at some stage. The eye-grounds may show retinitis, choroiditis, or neuritis of the optic disk. In the prolonged cases conjunctivitis and keratitis are often present.

Heart Action.—The pulse is slow and irregular. It may be intermittent, or now and then a case will be seen in which the pulse is very rapid—160 to 200—with a normal temperature.

The *respiration* is likewise disturbed, slow, and of the Cheyne-Stokes type. The respiration is very changeable at an examination, the rate being now slow and irregular, now very rapid.

The *temperature range* is in no way diagnostic, although temperature is usually present.

Emaciation.—There is such a marked loss in weight that the emaciation may be looked upon as one of the symptoms of the disease. In all cases there is wasting, and the longer the case, the greater is the emaciation.

A ward filled with these emaciated children, with their dulled, staring eyes and bent, rigid trunks and limbs, furnishes a most pitiful and gruesome picture.

Complications.—Considering the nature and severity of its symptoms, cerebrospinal meningitis is a disease with few complications. Pneumonia is only an unusual occurrence. Eye involvement is to be looked upon more as a feature of the disease than as a complication. Nephritis is exceedingly rare. Bed-sores are frequently developed, and become a troublesome feature, but again this cannot properly be considered a complication.

Prognosis.—The mortality is high. The number of cases of recovery is difficult to determine. The younger the child, the more fatal the disease. Cases of recovery under two and a half years of age are very exceptional. The earliest proved case to recover under my observation was nine months of age.

The cases that survive in an epidemic vary from perhaps 50 to 10 per cent. Not all patients who live, however, should be placed in the recovery class, because a considerable percentage of those who survive make very incomplete recoveries.

Among the sequelæ are idiocy, blindness, deafness, epilepsy, acute and chronic hydrocephalus, and spastic paralysis of different sets of muscles. I have several patients under my care who have survived meningitis and are considered to have had complete recoveries, who are, nevertheless, backward in school, have severe headaches, or who show marked absence of control.

Duration.—The duration of the disease depends largely upon the nature of the infection. Death may take place in a few hours, or the patient may linger for weeks. A boy twelve years of age, whom I cared for several years ago, died from exhaustion in the twentieth week of the disease. I have repeatedly seen children make partial recoveries and linger for several weeks in a wretched, emaciated condition

and eventually die from asthenia. Others make incomplete recoveries which place them in the dependent class for the remainder of their lives.

Treatment.—The Flexner serum is the only means at our command which promises any curative effects in this disease. The serum is prepared in the horse through immunization with the Diplococcus intracellularis and its toxin. Flexner states that the efficacy of the serum is dependent upon its bacteriologic properties.

Flexner has reported* his observations, based on 400 cases treated with the antimeningitic serum. In all the cases the diagnosis had been established by bacteriologic examinations. In arranging the records of the observations, account was taken of the age of each patient, the period of the disease when the serum was first injected, the number of injections made, the dosage of the serum, the effects on the temperature and the subjective and objective symptoms of the disease, on the number and viability of the diplococci in the spinal exudation, the general leukocytosis, the duration of the fever, and the manner of recovery—whether by crisis or by lysis. All cases which survived the first dose of the serum less than twenty-four hours were excluded, as marked beneficial effects could not be expected in so short a period.

Results According to Age of Patient.—Total number tabulated, 393; recoveries, 295; deaths, 98. Seventy-five per cent. recovered, and in 25 per cent. the issue was fatal. In the following table Dr. Flexner gives the relation between the recoveries and the ages of the patients:

Patients	Total Number	Recovered	Died	Per Cent. of Deaths
Under 1 year	22	11	11	50.0
Between 1 and 2 years	19	11	8	42.1
Between 2 and 5 years	68	52	16	23.5
Between 5 and 10 years	79	70	9	11.4
Between 10 and 20 years	105	80	25	23.8
Over 20 years	87	64	23	26.4
Age not given	13	7	6	46.1

Results According to Period of Injection.—Among 328 cases, the histories were sufficiently explicit to make it possible to approximate the period in which the first serum injection was made:

Period of Injection of Serum	Number of Patients	Recovered	Died	Per Cent. of Deaths
First to third day	121	103	18	14.9
Fourth to seventh day	100	78	22	22.0
Later than seventh day	107	68	39	36.4

It would seem, from the table, that while the cases injected early have the best opportunity for recovery, nevertheless, as some were injected after days and weeks of illness, it would appear that the useful-

* "Jour. Amer. Med. Assoc.," vol. li, No. iv.

ness of the serum did not cease as long as the diplococcus was present in the cerebrospinal fluid.

Manner of Termination.—In 270 cases Dr. Flexner was able to determine whether the termination was by lysis or crisis; 201 terminated by lysis and 69 by crisis.

Influence on Diplococcus, Spinal Exudate, and Leukocytosis.—Soon after the injection of the serum the diplococci became greatly reduced in number and wholly intracellular; they tended to disappear altogether; to present changes in appearance, as swelling and fragmentation, to stain diffusely and indistinctly, and to lose motility in cultures. In some of those with turbid and purulent exudates a rapid clearing occurred. Together with the clearing of the spinal fluid and the loss of pus-cells is associated the return of the circulating leukocytes to the normal.

Counts made before and after the injections often demonstrated a critical fall in the number of leukocytes in the blood-stream. Unfavorable indications were a continuation of the leukocytosis, the turbidity of the exudate, and the persistence of the diplococcus after the serum injections.

Dr. Charles Hunter Dunn gives an analysis of 40 consecutive cases of cerebrospinal meningitis treated by Flexner's serum.

In all, the Diplococcus intracellularis was found in the cerebrospinal fluid. Dr. Dunn's method was to make a lumbar puncture in every suspected case. If the cerebrospinal fluid was cloudy, the antiserum was used at once without waiting for a bacteriologic examination. If the fluid was clear, no antiserum was given until subsequent examination revealed the presence of the meningococcus.

In cases in which other organisms, such as the streptococcus or pneumococcus, were found in association with the meningococcus, the serum was not repeated, but in the cases showing multiple infection in which it was used, no apparent harm resulted.

In the cases in which a rapid and marked improvement occurred after the first injection, accompanied by a permanent fall of temperature to the normal, no further injection was given. In cases in which this did not occur, the injections were repeated daily until the nervous and subjective symptoms were completely relieved and the temperature had reached the normal, or until four doses had been given. In resistant or relapsing cases further doses were given. Dr. Dunn's routine dose was 30 c.c.; the largest dose given was 45 c.c.

In instances where the amount of fluid obtained was small, and in all instances where too great an increase of intradural pressure was feared, smaller amounts were injected, the minimum being 10 c.c.

Of the patients treated by Dr. Dunn, 9 died and 31 recovered, the mortality being 22.5 per cent. This, it will be seen, corresponds with the mortality of Dr. Flexner's cases. Among the patients who recovered, one was deaf and another blind and deaf. The recovery was complete in 72.5 per cent. of the cases.

Effects of the Serum.—According to Dr. Dunn, the three principal effects of the serum were: first, to produce a fall of temperature;

second, to produce a rapid improvement in the patient's general condition, accompanied by a more or less marked relief of certain symptoms; and third, to cut short the disease.

The effect on the symptoms and general condition is the most striking phenomenon observed in the use of the serum. In some instances there occurred a permanent return to consciousness, a disappearance of mental dulness and delirium, of headache, hyperesthesia, tenderness of the neck, and vomiting. These symptoms, according to Dr. Dunn, were relieved in twenty-four hours after the first injection, the patient changing in a remarkable way from a serious condition of coma to a favorable condition of normal mental activity.

In other cases the improvement occurred more slowly, and in others—the late chronic cases—no effects were noticed. The rigidity of the neck and Kernig's sign were the most persistent, so that at times patients appeared normal in every way, playing with other children in the wards while these signs persisted.

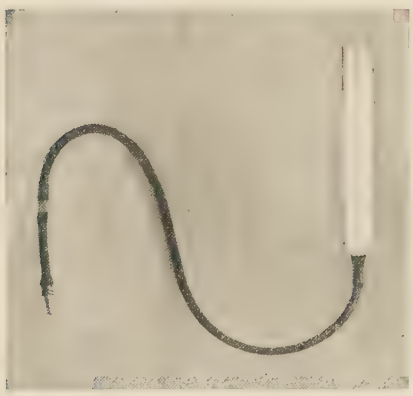


Fig. 73.—Apparatus for injecting serum.

Effects on the Cerebrospinal Fluid.—Successive examination of the cerebrospinal fluid twenty-four hours after the injection showed a striking change in the character of the contents. The number of organisms seen was much smaller, the chief change being that the majority were intracellular.

Early Use of Serum Important.—The earlier the serum is used, the more marked its effects. In 5 cases the disease was suddenly aborted after one dose of serum, recovery being complete. In 17 there was a rapid and permanent improvement. In 12 of these the serum was given in the first week; in 3, in the second week, and in 1, in the third week. In 8 the serum had no marked effect. Of these, 3 were in the first week, the other 5 being late chronic cases.

One patient in the late chronic stage began to improve after one dose of the serum and made a rapid convalescence. This would indicate that improvement is always possible in the presence of meningococci.

More Recent Methods in the Use of Serum.—Since the introduction of the antimeningitic serum in the spring of 1907 by Flexner, the mortality in infants has fallen from 95 per cent. to between 40 and 50 per cent. Even in view of this remarkable reduction in mortality, one must search for further improvement. The old method of serum treatment is undoubtedly inaccurate, and one is not able to judge with any degree of accuracy the quantity of serum injected, nor is the operator able to predict any untoward symptoms which might arise during the process of injection. It is true that few fatalities, as far as we know, have

occurred from the injection of too large a quantity of serum, but an improvement on the old procedure is welcome. During the recent Dallas epidemic Sophian, of New York, contrived a means of controlling the injection and frequently indicating the quantity of cerebrospinal fluid that can be withdrawn.

Theoretically, one would expect a return to the original pressure of the cerebrospinal fluid on injecting a volume of serum equal to the quantity of fluid withdrawn, but this is certainly not the case. Occasionally one may inject even larger quantities of serum than fluid withdrawn, but the pressure readings of the fluid are frequently lower than before the removal. In view of this unreliability of pressure in the spinal fluid and dangers attached to the old method, Sophian, in 600 lumbar punctures, used the blood-pressure as an index, with almost uniform results.

Procedure.—An assistant takes the blood-pressure readings throughout. On withdrawal of the fluid there is usually a drop in blood-pressure from 5 to 8 mm. of mercury. Exceptionally there is a rapid fall, and then the blood-pressure is a guide to the rate and quantity which may be removed. In some cases a rise occurs, and in these instances the fluid may be removed until normal cerebrospinal fluid pressure is reached, which, roughly speaking, is one drop of fluid every three to five seconds.

After the withdrawal of a suitable quantity of cerebrospinal fluid the serum is ready to be injected. The latter is warmed to body temperature and injected by the gravity method with the use of the funnel and tube (see Fig. 73), as this is much superior to the syringe, because the injection can be more regularly controlled, and also from the fact that the forcible and rapid injection produces an accelerated fall in blood-pressure. With the commencement of the injection of the serum into the subarachnoid space, the funnel being raised or lowered to regulate the flow, the blood-pressure begins to fall and continues to drop as the serum is injected. After a fall of 5 to 7 mm. with continued injection, the pressure begins to drop relatively much faster. With a blood-pressure of 80 to 85 mm. after withdrawal of fluid, a drop of 7 to 10 mm. is usually safe, but when this latter point is reached, the injection should be stopped until the pressure begins to rise; then the injection may proceed. If, however, the pressure continues to fall, the injection should be immediately stopped, and if untoward symptoms set in, some, if not all, of the serum should be withdrawn.

The average time is considerably less than that employed by the older method. Ten to 15 c.c. are usually required, and rarely is it necessary to use more. This method is of great benefit not only in the average case, but also in the atypical and difficult ones; thus, in the instance of thick, plastic exudate when the fluid will not flow through the needle, it is an excellent guide, absolutely indicating how much serum one can inject safely under pressure.

The clinical symptoms associated with the drop in blood-pressure are stupor, deepening more and more, superficial respiration, irregular,

at times deep and slow, while the child grows more drowsy, in contrast to the restlessness previous to injection. No reliance can be placed on the pulse. The first symptom may be a rapid dilatation of the pupil. If the above-mentioned symptoms supervene, the head should be raised, artificial respiration begun, and adrenalin, atropin, or cocain injected intramuscularly. Almost without exception the patient responds.

Action of the Serum.—The serum produces its beneficial effects by acting directly upon the meningococci, the multiplication of which it inhibits; it is thus bacteriolytic, but at the same time many of the diplococci are charged with opsonin and made more ingestible by phagocytes, by which they again suffer an accelerated solution (Flexner). For this reason the spinal fluid quickly fails to yield cultures of the meningococcus, even though it may still be discovered by microscopic inspection. The meningococci that are reached by the serum are, with few exceptions, rapidly brought under control; the persistence or progression of the infection is due to the inaccessibility of the diplococci in the thick exudate, or to an obstruction at the base of the brain. In the latter instance delay should not be countenanced before injecting into the lateral ventricles, which is easily accomplished in infants through the fontanel and in older children by trephining. Several such instances of cure by this method are on record.

The progress and treatment should thus be guided by the lessening turbidity of the fluid, the diminution and absence of growth on culture-media, increase of phagocytosis, and disappearance of the diplococci on microscopic inspection.

Other Methods of Treatment.—Lumbar puncture as a therapeutic measure is of only temporary benefit in relieving the active symptoms caused by cerebral pressure.

The use of the ice-bag to the head and spine, as generally practised, is not of the slightest value.

Constipation must be relieved by enemata or simple laxatives, such as fluidextract of cascara sagrada (aromatic) or laxative salines.

The Diet.—The emaciation in these cases is rapid and extreme, which necessitates that forced feeding be employed. Milk is our best means of nourishment, either plain or mixed with thin gruels. It will be better digested when prepared with the gruels. If swallowing is impossible, the milk should be given by gavage (p. 758).

I have yet to know of a drug that has the slightest curative value, and when we remember the nature of the lesion, drug effects cannot be expected. Our measures are nutritional and palliative. For the details of the palliative treatment the reader is referred to the treatment of acute meningitis (p. 529).

Cerebrospinal Fluid in Meningitis.—In most cases of meningitis the spinal fluid is under increased pressure. The wide variations reported by different observers in the normal pressure, which is influenced considerably by the posture of the patient, render accurate determinations of the pressure in suspected cases of meningitis of little practical value. The actual appearance and composition of the fluid are of greater

importance. In nearly all types of acute meningitis the fluid is cloudy, and, in pneumococcus infections, frequently thick and purulent. With the exception of the fluid of tuberculous meningitis, that in all forms presents an increase in the polynuclear cells. In tuberculous meningitis the fluid may be clear or very slightly opalescent, and commonly shows a preponderance of lymphocytes. Very exceptionally, in rapid cases of epidemic meningitis, the fluid may be clear. In any case the diag-

Fig. 74.—Position for and site of lumbar puncture.

nosis may be substantiated by the demonstration of the specific bacterial agent in the coagulum or sediment which is formed in the fluid on standing.

LUMBAR PUNCTURE

The site selected for lumbar puncture is on a line between the crests of the ilia and between the spinous processes of the third and fourth lumbar vertebræ.

Fig. 75.—Quincke's needle.

Position of the Patient.—The child should rest on one side (see Fig. 74), sufficient pressure being exerted on the buttocks to make the spinous processes prominent. The Quincke needle (Fig. 75) should always be used in making the puncture. The stylet which fits the beveled edge of the point of the needle effectually prevents its being plugged.

Method.—The skin for several inches about the site of the puncture should be scrubbed with the tincture of green soap and alcohol. The physician's hands should be thoroughly disinfected. Considerable

force may be necessary in order to enter the canal. When there is a sudden giving way of the obstruction to the progress of the needle, one may know that the canal has been entered. The puncture may be made in a line with the spinous processes or from the side, the needle being passed between the laminæ and inward about one inch. When the point of the needle has been introduced into the spinal canal, the stylet is withdrawn. The cerebrospinal fluid may escape with force in a stream as a result of the pressure or it may exude drop by drop. A sterile tube should be in readiness in order to collect the fluid for examination. In dealing with older children after the third year it is often easier to introduce the needle slightly to the right or left of the line of the spinous processes.

When the canal is entered and the cerebrospinal fluid does not pass readily through the needle, the flow may be increased by elevating the child almost into a sitting position with the head forward. A dry tap usually means that the canal has not been entered. For some children it will be necessary to employ a slight degree of anesthesia. I have used both gas and chloroform for this purpose.

Uses of the Lumbar Puncture.—Lumbar puncture is of the greatest value for diagnostic purposes, but its therapeutic value is practically nil. By it we may make the diagnosis of meningitis positive, and differentiate the different forms of meningitis. In meningitis the withdrawal of an ounce or two of fluid will sometimes furnish temporary relief to the patient. The retraction of the head and the spasticity will generally be relieved for a time. I have repeatedly withdrawn the fluid in such cases when there was a tense bulging of the fontanel, and after two or three hours have passed, have found the fontanel still depressed; it would soon become prominent, however, and in eight or ten hours would often be as tense as before. The advantage of lumbar puncture, therefore, is largely of a diagnostic nature, only temporary relief being furnished the patient by the operation. The introduction of drugs into the canal for bactericidal purposes is valueless.

Flexner's serum in cerebrospinal meningitis (p. 536) is, of course, administered through the use of lumbar puncture.

XIV. DISEASES OF THE SKIN

The skin of an infant is to be looked upon as an organ with important functions to perform. On account of its location it is the most exposed organ of the body; among its most important functions is, therefore, protection of the underlying structures.

In the skin, moreover, are located the most important organs of excretion, the sweat-glands, as well as those very delicate nerve structures, the tactile organs. Through the skin, heat radiation is carried on by means of the circulating blood in the capillaries. When we consider the active metabolic processes that are taking place in the infant's body, it is not hard to appreciate the amount of work the skin is called upon to do in performing its functions of excretion and heat radiation.

Care of Skin in Health.—The skin in the infant is particularly delicate, and responds very readily to external irritation of any nature. Excessive clothing at any time of the year, but more particularly in summer, produces the well-known prickly heat or sudamina. Eczema may result from the irritant effects of improper clothing.

The different forms of intertrigo are the result of irritation produced by the contact of unclean napkins containing urine or feces or both. In order to avoid intertrigo the napkin must be changed during the waking hours whenever the urine is voided. In some instances it is not well to wake a child for a change of napkin because of urination; and at other times during the day, such as the outing period, the clothing cannot always be changed in the park or street. Under such circumstances a prophylactic measure should be employed. Over the groin and folds of the buttocks should be spread pieces of old linen which have been well smeared with the following ointment:

℞ Ceræ albæ ..... ʒiv
Ungt. zinci oxidi ..... q. s. ad ℥iv

The addition of white wax to zinc oxid ointment acts as a waterproof dressing to the skin, and protects it from the irritating products of decomposing urine.

Clothing that is applied too tightly will act as an irritant to many skins. To many wool acts as a decided irritant, and frequently it must be avoided. In some instances it has been necessary to line the child's undergarments with thin old linen, such as a handkerchief. Linen mesh underclothing may be used.

In order further to keep the skin healthy, the child should be bathed in a tub once a day with Castile soap, then carefully dried, and powdered with a simple powder.

The following powder I have used extensively for years:

℞ Acidi borici.....gr. xxv
Pulv. amyli
Pulv. zinci oxidi.....āā ℥ss
M. Sig.—Apply freely.

I prefer the evening bath. In the morning the child is sponged with warm water and soap and carefully dried, after which the powder is applied. During the cold weather the bathing and sponging should be done in a warm room with a temperature over 75° F.

The above simple means are all that are necessary to keep the skin in a normal condition. The skin of some children is much more sensitive than that of others, and will require more careful attention.

MILIARIA (PRICKLY HEAT)

The rash in prickly heat consists of multiple, minute, transparent vesicles, due to an engorgement of the vessels of the sweat-glands and obstruction of their outlets.

Symptoms.—The child is very uncomfortable and restless. The itching is evidently very distressing. The rash described is characteristic, and usually appears quite suddenly. The mild cases are without inflammation. The inflammation, when present, produces a general erythema with many reddened papules.

Etiology.—Nearly every infant in our climate suffers from prickly heat during the summer. The condition in summer is caused by profuse sweating, incident upon the hot weather and independent of possible overclothing; in winter, by too hot living rooms and overclothing.

Treatment.—Heavy clothing and flannels are to be avoided. In order to lessen the local irritation, the garment worn next to the skin should be lined with silk or linen, or linen mesh garments should be worn. The further management directed both to the relief of the patient and the cure of the condition consists in the frequent application of cool water, either by means of a tub-bath or sponging. The soda bath, the bran bath, and the starch bath (p. 750) are all most useful. For purposes of sponging a solution of bicarbonate of soda should be used—one tablespoonful to a gallon of water. The relief afforded the patient depends not so much upon what is used in the water, as upon the fact that plenty of cool water comes in contact with the itching, burning skin. Ointments and salves are here of little service, as they tend to produce further maceration of the skin. As local applications, powders are to be preferred to lotions. A powder used with satisfaction for this condition is of the following composition:

℞ Acidi salicylici.....gr. x
Acidi borici.....gr. lx
Pulv. amyli,
Pulv. zinci oxidi.....āā ℥j

This is to be dusted freely over the involved surface several times daily—every hour if necessary. In case irritation is produced by the salicylic

acid, it may be omitted or its strength may be decreased by the addition of powdered starch.

URTICARIA (HIVES; NETTLE-RASH)

A discussion of all the aspects of urticara is unnecessary. Only those forms will be considered which are peculiar to children.

Acute urticaria is characterized by the sudden appearance and disappearance upon the skin surface of wheals and lumps of vasomotor origin. The wheals, which are of varying size, produce intense itching and burning, and then subside without desquamation as rapidly as they have appeared. The variation in size and shape has given rise to a differentiation into types for purposes of diagnosis.

Distribution.—The possibilities of skin involvement in hives are most variable. There may be but one wheal, or the lesions may cover a large portion of the skin surface. The involved area may be very small, of the size of a pin-head, or extremely large (giant hives, below), occasionally producing marked facial deformity. Thus in the case of a child of eleven months who had been given an egg for the first time the face was so distorted and grotesque that recognition was impossible.

Etiology.—Urticaria may be due to agencies operating either from without or within the body. Those operating from without include irritants of almost any nature, especially the bites of insects, and too tight clothing or clothing which may directly irritate the skin. Contact with certain plants may also produce the wheal hives, termed "nettle-rash." Such causes as these, however, are operative in comparatively few cases.

Irritation arising from internal sources is the cause of the condition in at least 95 per cent. of the cases. The use of certain drugs may occasion sufficient irritation to cause an outbreak. In not a few instances I have seen hives due to quinin, arsenic, and antipyrin. The administration of antitoxin produces hives in from 15 to 20 per cent. of the cases. Certain articles of food, such as strawberries, tomatoes, oatmeal, and buckwheat, invariably cause urticaria in some children. An attack may occur without apparent digestive disturbance, or may appear coincident with vomiting, diarrhea, fever, and other acute gastro-intestinal symptoms. The condition is due to a toxin from alimentary sources which produces vasomotor disturbances of the skin blood-supply, resulting in localized vascular paralysis and transudation. The itching is due to irritation of the nerve end-organs.

Giant Hives (Angioneurotic Edema).—This condition is of comparatively rare occurrence in children. I have seen but a few cases. It is simply a variety of urticaria occasioned by causes similar to those operative in other forms. When it occurs in children, it most frequently involves the tongue and lip. When involving the soft parts, the lesion may produce an immense amount of swelling. This is particularly marked when the tongue and lips are affected. I have seen the lips swollen to several times their normal thickness. In a boy four years of age the tongue and lower lip were so greatly swollen that speak-

ing was impossible and swallowing difficult, and it was supposed that he had been given carbolic acid or some corrosive poison. Such cases usually develop suddenly and occasion no little alarm. In the case referred to I was called 30 miles into the country to see the child in consultation. Cases have been reported in which the swelling of the tongue was sufficient to produce suffocation, requiring incision to reduce the swelling.

The cases seen by me have all been associated with gastro-intestinal disturbances. The swellings ordinarily disappear rapidly after a few hours, but not with the rapidity which marks their initial appearance.

Treatment.—Digestive disturbances of any nature, whether acute or chronic, may cause urticaria. In the event of an attack, therefore, even though there be no active manifestations of indigestion, the origin of the trouble will usually be found in the intestine. A safe procedure is to give two to four teaspoonfuls of castor oil, or 1½ grains of calomel in divided doses, followed the next morning by the citrate or milk of magnesia. At the same time the diet, regardless of the age, should be reduced to broths and gruels, to which toast or dried bread may be added, depending on the patient's custom. Milk should not be given. The application of a menthol ointment (menthol, 10 grains; rose-water ointment, 1 ounce) is a valuable supplementary measure.

In cases caused by antitoxin and food allergy, salicylate of soda (wintergreen) will effect a termination of the symptoms sooner than will any other agent. To a child three years of age 2 grains of the salicylate of soda may be given every two hours, with 4 grains of the bicarbonate of soda—5 doses being given in twenty-four hours. To older patients from 3 to 4 grains of the salicylate may be given at a dose—from 12 to 24 grains being administered in twenty-four hours. Certain children appear to be predisposed to urticaria, and give a history of having had several attacks. Those who suffer from persistent intestinal indigestion are very liable to recurrent attacks, which are sometimes very obstinate in character. Urticaria due to the ingestion of a drug will disappear when the drug is withdrawn.

The management of the cases due to local causes demands the removal of the source of the irritation and the application of the menthol ointment, or bathing of the affected parts with a 1 per cent. carbolic acid solution.

RHUS POISONING (IVY POISONING)

Contact with the *Rhus toxicodendron* produces in many people a most active dermatitis, characterized by marked burning and considerable itching of the involved surface. There may be a simple erythema, but usually there are small vesicles and bullæ filled with serum, which, if they become infected, form pustules, with the possibility of multiple abscesses. The exposed portions of the body—the hands, arms, face and neck—are the most frequently affected sites. When the face is involved, great disfigurement may result.

Treatment.—I have used various measures from time to time in the

treatment of this form of dermatitis. For the acute stage—the period of itching, burning, and edema—a remedy of considerable value is a wet dressing of the fluidextract of *Grindelia robusta*, 1 to 1½ drams to the pint of water, applied on lint or soft old linen. The solution should be used cold and renewed every fifteen to thirty minutes. During the stage of resolution a saturated solution of boric acid may be used in the same way, or, more conveniently, an ointment composed of 5 per cent. boric acid in rose-water ointment. This is applied to the parts on linen, after which resolution usually promptly takes place. When pustules develop, they must be opened and the parts treated with a wet dressing of a saturated solution of boric acid.

A solution of permanganate of potash, 1 : 2000, is a most satisfactory means of treatment. The involved parts are freely moistened with the solution at intervals of about two hours, the solution meantime being allowed to dry on the parts. This often readily controls the acute symptoms. After a few days a 10 per cent. boric-acid ointment may be used to soften the skin and remove the crusts and products of the exudation.

SCABIES (ITCH)

Scabies is a contagious disease of the skin, caused by the burrowing of the female itch-mite, *Acarus scabiei*.

Location.—The parts selected for invasion are those portions of the skin which are least protected and least resistant, the favored sites being between the fingers and toes, in the axilla, and in the groin. The skin over the trunk is usually invaded secondarily.

The impregnated female burrows a tunnel into the layers of the skin, which serves as a habitat for the mite during her life.

In the burrow or canal are deposited the eggs, larvæ, and excretions of the acarus, and these act as an irritant, producing papules, vesicles, and skin infiltration. The presence of the parasite and its products causes intense itching which, through scratching, indirectly adds to the existing skin irritation. If the skin is clean, the burrows may be seen with the aid of a magnifying glass. Upon removal of the epidermis at the end of the canal the parasite may be removed with a needle.

Diagnosis.—Itching is intense and may be confined to the skin areas described, or involve all portions of the skin surface. A point of diagnostic value is that the itching is much worse at night due to the fact that the mite evidently becomes more active as a result of the increased warmth and quiet supplied by the unwilling host.

In a well-marked case as a result of the action of the acarus together with the trauma produced by scratching there is a complex skin picture very difficult to describe. An eczema with all its possibilities of skin inflammation and infection usually supervenes. The burrows have the appearance of dark colored lines extending in a tortuous, zigzag course rarely exceeding ½ inch in length, and these are usually visible in sufficient number to make the diagnosis positive.

Treatment.—The cases differ greatly in severity, but in all the treat-

ment is practically the same, varying only in respect to the necessity of its repetition or continuation. At bedtime a hot bath is ordered, from 105° F. to 110° F. While in the bath the patient is vigorously scrubbed with a towel and yellow laundry soap. After the scrubbing he is dried vigorously and sulphur ointment, U. S. P., rubbed as vigorously into the skin. This process is repeated twice at intervals of forty-eight hours. The repetition at twenty-four-hour intervals is usually too irritating to the skin. The third treatment usually terminates the case. For quite young children, to whom the sulphur ointment may be too irritating, and for older children also if the first application produces considerable dermatitis, the ointment may be diluted one-fourth or one-half by the addition of vaselin. Care must be exercised to destroy, boil, or otherwise disinfect all clothing previously worn by the patient.

FURUNCULOSIS (BOILS)

Boils are frequent in delicate, poorly nourished infants and children, and are due to an inoculation of the deep layers of the skin with the staphylococcus. Boils may develop in well babies, even under proper management, for many delicate skins possess a very poor resistance to the staphylococcus. Often there will be a crop or two comprising perhaps not over five or six lesions in all. In marasmic infants and poorly nourished young children, however, the lesions may occur in great number. I have opened over one hundred furuncles in one patient in caring for the successive crops as they appeared. The scalp is apparently the most fertile field for their development. I have repeatedly seen the boils coalesce, forming a large, sloughing suppurating mass. In aggravated cases, in delicate infants with low resistance, fatal results are not unusual in institutional work. What might be looked upon as a chronic condition of furunculosis sometimes exists in older children. I have two patients, brothers, who have been afflicted with recurrent boils, caused by the Staphylococcus aureus. One boy recovered after one year's treatment. The other, after eighteen months, was still having the boils, in spite of autogenous vaccine. During a period of four months he had received 1,725,000,000 of the dead organisms without pronounced effect.

Treatment.—*Local.*—When pus is evident in the boil, a free incision should be made and the pus expressed. The skin about the wound should be washed vigorously with tincture of green soap or ordinary soap and water. Applying a few drops of a solution of bichlorid of mercury is of little or no value, and will not be sufficient to prevent a reinfection, as some pus invariably escapes upon the surrounding healthy skin when many boils are opened. A wet disinfectant dressing or a disinfectant ointment should follow incision and cleansing. Bichlorid dressings are to be used only temporarily in children. The dressing which has appeared best to prevent the spread of the infection when the involved area is not too large is a saturated solution of boric acid, applied by means of gauze or lint. In a marantic child, when a considerable portion of the surface over the trunk or thorax needs to be covered

the repeated renewal of the solution causes a reduction in temperature which is not desirable. In treating such infants, and in out-patient work where a wet dressing cannot be used, an ointment of 15 per cent. boric acid in vaselin is thickly spread on lint and applied to the wound and a considerable portion of the surrounding area. The dressing should be changed every six hours. Ichthyol is of little service when used in a strength of less than 20 per cent. The odor is disagreeable; the application stains the skin and the clothing and controls the condition no better than does the boric-acid ointment. Moreover, the latter is comparatively inexpensive. In treating fat children who sometimes develop boils on the abraded surfaces at the folds of the neck or the nates, and children who perspire freely, I have used a dusting-powder composed as follows:

℞ Pulv. acidi borici ..... ℥j
Pulv. amyli,
Pulv. zinci oxidi ..... āā ℥iss
M. Sig.—Dusting-powder.

This is applied as soon as the wound is closed, and the parts are thus kept dry.

The *autogenous vaccines* have been most serviceable in the treatment of furunculosis in infants. (See Vaccine Therapy, p. 764.)

Constitutional.—The constitutional treatment is important. If the child is marasmic or suffers from malnutrition, the general treatment suggested for these conditions should be brought into use. If delicate or anemic, the patient should have the advantage of the suggestions on p. 134. In the many cases which I have treated, internal medication, other than that directed toward the improvement of the general constitutional condition, has been without value. The sulphid of calcium and other drugs which are supposed to have a direct influence upon the condition have proved of no service. They were not considered valueless because the child did not recover, for if not too reduced in vitality, the patient always recovers, regardless of the treatment. Observation on a series of cases of this type, for which opportunity was afforded by institution work has shown that those treated with the sulphid of calcium, for example, made no greater progress than did those to whom it was not given. The existence of this line of treatment is an example of "heredity in medicine." A remedy advocated by some one of consequence in the past is handed down from generation to generation by writers, many of whom, not having had opportunity to support their advocacy of the measure with observations of value, simply repeat what has been said by their predecessors.

Yeast as a remedy has been used in a few cases under my observation at the Babies' Hospital. A total of one-sixth of an ordinary yeast-cake is given between the feedings during the twenty-four hours. The results thus gained have been sufficiently satisfactory to warrant further observation.

No matter how extensive the process, children with furunculosis may be bathed as in health. To the water for the bath, which should

first be boiled, bicarbonate of soda, one tablespoonful to the gallon, should be added. There should be little or no friction of the skin.

PEDICULI (HEAD LICE)

Head lice, pediculi capitis, constitute a very frequent source of annoyance in out-patient and hospital work among children. Occasionally children better situated may become infected in school or in public conveyances and carry the vermin to other members of the family. I have repeatedly known all the female members of a household to become infected.

Symptoms.—As a result of the irritation produced by the insect and the enforced scratching, an eczema of the scalp is of frequent occurrence. The eczema may be slight or give rise to a most extensive and disgusting condition. The suppurating scalp, matted with pus, crusts, nits, and vermin, supplies a picture disagreeable even to consider. In not a few instances I have seen the brows and eyelashes involved. A slight degree of postcervical adenitis is the rule in cases of some weeks' duration.

Diagnosis.—The diagnosis does not depend upon finding the live vermin. The louse cements its egg to the hair, and the presence of the "nit" is in itself diagnostic.

Treatment.—The most successful and cleanly treatment consists in cutting the hair short. The head should then be washed with soap and water twice a day; and once daily after the drying, the scalp should be thoroughly moistened with the following solution:

℞ Acidi acetici . . . . . ℥ij
Ætheris sulphurici . . . . . ℥iij
Tincturæ delphinii,
Spiriti vini rectificati . . . . . āā ℥iv

Improvement will follow a few treatments. The pediculi will be killed and the nits may be removed with a fine-tooth comb. If the patient is a girl, it is not absolutely necessary to sacrifice the hair. It may be parted from various portions of the scalp and the solution applied, without the previous washing. However, if the hair is not cut, a much longer time will be required to effect a cure.

TINEA CIRCINATA (RING-WORM)

Tinea circinata, ring-worm of the body, is a highly contagious parasitic skin infection.

Etiology.—The disease is due to the trichophyton fungus, which is identical with that causing tinea tonsurans. The exposed skin surface, the neck, and hands are the sites most frequently involved.

Domestic animals are subject to the disease. It is rare in cows and horses, but quite common in dogs and cats. Children are often infected from cats and dogs.

Symptoms.—The disease usually makes its appearance in the form of a small, reddened, irregular-shaped area, which soon becomes circular and is covered with a fine, scaly desquamation. The area is sharply

defined and spreads through the development of fine papules around the border of the patch. As the process extends there is a paling and smoothing out of the surface in the middle of the patches, while the exterior border remains somewhat elevated and reddened. This produces in the lesion a ring-form appearance which has given rise to the term by which it is known. There may be but one lesion or there may be dozens of varying sizes, ⅛ inch to 2 or more inches in diameter. Occasionally the smaller patches run together, forming large areas of irregular shape.

Diagnosis.—The diagnosis is usually not difficult. The characteristic well-defined ring, circumscribed and usually multiple, is not simulated by other skin diseases. In some cases in which the margin is not so well defined, and in those which show one or more circumscribed scaly areas, the lesion may be confused with a patch of seborrheic eczema. Psoriasis may resemble ring-worm. Psoriasis is, however, very rare in children. Furthermore the lesions of psoriasis are usually located and grouped on the extensor surfaces and at the margin of the hair, and the scales are thicker and more abundant than those of ring-worm. In patches of acute eczema the characteristic abrupt margin is absent, itching is more marked than in ring-worm, and the inflammatory manifestations are changeable from day to day, while in ring-worm the appearance of the lesion is without change. If doubt exists and the latter condition is present, a microscopic examination of the scales to which a few drops of liquor potassii have been added will reveal the presence of the long, delicate threads of mycelium and thus settle the diagnosis.

Treatment.—The treatment consists in the use of some irritant that will produce a desquamation of the superficial layers of the skin in which the fungus is located. The tincture of iodin has proved a satisfactory remedy whenever the lesion is located where its use is possible. Two or three applications of the U. S. P. tincture at twenty-four-hour intervals constitute all the treatment ordinarily required. If the case proves obstinate, 2 grains of the bichlorid of mercury may be added to each ounce of tincture of iodin. If the lesion is situated on the face or elsewhere on the exposed surface of the body, 5 grains of bichlorid of mercury may be dissolved in equal parts of alcohol and glycerin and applied locally three or four times daily until a slight dermatitis results.

A rapid cure follows this treatment.

TINEA TONSURANS (RING-WORM OF THE SCALP)

Ring-worm of the scalp is of frequent occurrence in institutions for children, and is greatly dreaded because, when once it gets a foothold, it is most difficult to eradicate. In one epidemic of which I had charge there were over 100 cases. These cases were all cared for by nurses and orderlies who lived in the wards with the children and not one case occurred in an adult. The susceptible age appears to be from the third to the tenth year.

Etiology.—Ring-worm is due to the action of the trichophyton fungus.

The disease, which is most contagious, is transmitted by exchange of caps, by means of towels, brushes, combs, etc. The diseased hair, according to Crocker, when placed under the microscope, after being soaked in B. P. liquor potassæ for half an hour and gently pressed out under the cover-glass, presents the following appearance: The hair may be seen bent like a green stick, while the free end is frayed out like a brush, and (with a power of at least 200 or 300 diameters) abundant conidia or spores, with scanty mycelium, may be seen to permeate the shaft, both downward to the root end and upward above the surface for some distance, this appearance differentiating the condition from favus. Between the inner root-sheath and the shaft the conidia are also apparent in great numbers, but the mycelium is less abundant in the hairs than in the scales. The conidia measure from 4 to 5 micra, and are round and sharply contoured, with a central nucleus like a black dot. The mycelium consists of well-defined, transparent, branched and pointed threads, terminating in conidia. They may be seen best in the shaft near the bulb or between and on the scales.

Diagnosis.—The diagnosis is not difficult. The circular circumscribed patch with the short "stubbles" of hairs on the otherwise normal scalp is simulated by no other condition. The diameter of the involved area varies from ½ inch to two or three inches. A large denuded area is usually the result of the coalescing of smaller areas. There may be but one involved area on a scalp and there may be a dozen.

Prophylaxis.—To prevent an epidemic when the disease breaks out in an institution which is the permanent home of children is most necessary and yet most difficult. The only means of stopping the spread of the disease, in my experience, has been in having the heads of all the unaffected children closely clipped and giving them a shampoo of equal parts of kerosene and olive oil twice weekly.

Treatment.—Cures are difficult, and the treatment must be along radical lines. In an epidemic several years ago at the Country Branch of the New York Infant Asylum, abundant opportunity was offered to test the various measures of treatment advocated by different observers. Among the applications used were chrysarobin in various combinations, carbolic acid, iodin, bichlorid of mercury, sulphur, and white precipitate.

The location of the fungus in the hair-follicle renders it very difficult to apply any drug so that it will be effective as a parasiticide. In order to accomplish this it is absolutely necessary to cut the hair of the entire scalp as short as possible. Upon beginning the treatment the scalp is thoroughly scrubbed with water and strongly alkaline yellow laundry soap, so as to remove all the dead hair and desquamated epithelium. The parasiticide to be used is then rubbed into the diseased area and for a considerable distance over the surrounding healthy scalp. The parasiticide which proved most valuable to us was composed of bichlorid of mercury, 2 grains in ½ ounce each of olive oil and kerosene. The bichlorid must be dissolved in a small quantity of alcohol before it is added to the oil mixture. This is rubbed into the diseased area every day until the scalp becomes sore and tender. In order to prevent

the spread of the infection to other parts, the kerosene and olive oil without the bichlorid may be applied every fourth day, without friction, to the entire scalp. To effect a prompt cure it is necessary to produce a dermatitis at the site of the lesion. When this occurs, the treatment is temporarily discontinued. As soon, however, as the dermatitis subsides another inflammation is produced in like manner. After three or four weeks this treatment may be discontinued while the patient is still kept under observation, in order that the physician may confirm the results. A daily application of sterile oil aids in bringing the skin to a normal condition.

In treating one-third of the children in the epidemic referred to, 2 grains of the bichlorid of mercury were added to 1 ounce of the tincture of iodin. Twenty-six cases were treated by this method, with an average duration of treatment of eight and one-half weeks. Several recovered in four weeks, while for others twelve weeks of treatment were necessary. So long as the treatment is in progress the child should wear a cap, day and night. This may be made of any cheap, light-weight material, which, after a day or two of use, may be burned. In our cases cheese-cloth caps were used. Rubber gloves were necessary to protect the hands of the nurse who made the applications, especially if there were many heads to be treated.

In this epidemic, which was controlled by the above means, prophylaxis was obtained by the use of the kerosene and olive oil without the bichlorid. It was found impossible to maintain a quarantine permanently or effectually even for a short time, particularly during the warmer months. Therefore every inmate of the asylum of the "run-about" age who did not have the disease was treated as an incipient case. Every head was "clipped" and the hair kept short. Twice a week the children were given a kerosene and olive oil shampoo.

In private work the continued use of kerosene and olive oil is not popular, for reasons readily understood. In such cases the hair should be clipped as soon as the case is diagnosed, and a kerosene shampoo given. The bichlorid of mercury, 2 grains to 1 ounce of tincture of iodin, U. S. P., should be applied to the parts with sufficient vigor to produce a dermatitis. If the disease shows a tendency to spread beyond the original site, it is best prevented by the use of the kerosene and olive oil, in the manner above described.

IMPETIGO CONTAGIOSA

Impetigo contagiosa, as the name implies, is a contagious disease of the skin. Several children in the same family or school often have the infection at the same time. I have known one school-child to infect an entire class of 20. Cases of impetigo are seen almost daily in large out-patient clinics for children. The exposed parts comprising the face, head, and hands are those most frequently involved.

Etiology.—Bacteriologic examination shows a mixed infection with staphylococcus predominating.

Symptoms.—At first the lesion consists of a few closely grouped vesicles, which rapidly develop into pustules. These shortly form a dry crust of variable size and thickness. One area or a dozen or more may be involved. Several small lesions may coalesce, forming one large lesion. I have seen the crusts two inches in diameter. They rest upon an inflamed base, which bleeds slightly when they are removed. There are no constitutional symptoms, and rarely is there itching. The only evidence of the disease is the disfigurement occasioned by the dry, adherent crusts.

Treatment.—The most satisfactory procedure has been to soften the crusts by the application of gauze saturated with sterilized olive oil, the gauze being bound to the parts. Usually in twenty-four hours the crusts may readily be removed. Afterward an ointment of 10 per cent. boric acid in ointment of rose-water, or one composed of 10 per cent. ichthyol in vaselin, should be spread on sterile gauze and bound to the suppurating surface. The dressing should be changed at least night and morning. Recovery is usually complete in from two to three days. When the crusts are on the lip or other portions of the face where the dressing described cannot readily be applied, the lesions should be kept moist with either the boric acid or ichthyol ointment. If the gauze is not used, fresh ointment should be applied at least every three hours, both before and after the crusts are removed.

PEMPHIGUS NEONATORUM

Pemphigus in the newly born is an infection of the skin manifesting itself in a bullous eruption, which may appear on any portion of the surface. During the past ten years there have been two epidemics of pemphigus at the New York Infant Asylum, involving in all about 30 cases. The patients were mostly well-nourished infants. The origin of the disease in each epidemic was unknown. From a few hours to a day after birth the bullæ of seropus appeared, and in several cases the process was so extensive through their coalescence that large portions of the skin surface were denuded when the bullæ ruptured. The disease is very contagious, and these epidemics were only stayed by rigid quarantine of all the newly born and by closing the operating room. Examination of the serum from the bullæ of several cases showed the Staphylococcus albus. The mortality was about 20 per cent.

Treatment.—The management of the first epidemic consisted in opening the blebs and in the application of various antiseptic solutions and ointments. Not much improvement followed until creolin baths were used. This treatment not only relieved those cases which had developed, but the systematic bathing in a 1 per cent. creolin solution of all the newly born in the institution apparently prevented the spread of the infection.

During the second epidemic the house physician, Dr. Carswell, believes that favorable results were obtained with a 30 per cent. solution of ichthyol kept applied to the parts and changed three times a day.

ERYTHEMA NODOSUM

Erythema nodosum is characterized by the formation, in the skin and connective tissue, of multiple brownish nodules of varying size.

Location of the Lesion.—The nodules are most frequently seen over the anterior surface of the leg.

Etiology.—I look upon the disease as an infection—one of the many protean manifestations of rheumatism. In my cases endocarditis has not been a complication. All my cases have been in rheumatic subjects, and associated with peliosis rheumatica.

Symptoms.—Previous to the appearance of the nodules, there may be fever and loss of appetite and general indisposition on the part of the child. According to my observation these prodromal symptoms have, however, been unusual, the local manifestations constituting prominent symptoms, and in some cases the only evidence of the disease. The nodes are very painful to the touch, and show a black and blue discoloration. The entire anterior surface of the tibia may have a bronzed appearance.

Pigmentation follows the disappearance of the nodules.

In mild cases the pain is confined to the lesions. In severe attacks there is not only fever, as already mentioned, but also a great deal of joint pain and muscle soreness.

Treatment.—If there is fever, the patient should be kept in bed until the acute febrile period is passed and the nodules begin to disappear. The treatment is begun with the administration of one or two grains of calomel, followed by a saline laxative.

Milk and a vegetable diet are prescribed. A very small amount only of sugar is permissible. As a rule, my best results from drug therapy have been gained by the use of 5 grains of the salicylate of soda (wintergreen) in combination with 10 grains of sodium bicarbonate in 6 ounces of water after meals.

Illustrative Case.—A delicate girl had three crops of nodules, the different crops having appeared at intervals of about three months. The first attack was associated with peliosis and urticaria. The treatment which I had employed successfully previous to this case consisted of the use of the salicylate and bicarbonate of soda. This patient, who is markedly rheumatic, had taken large quantities of the salicylate, and its readministration had no effect; but in all three attacks the nodules began to diminish and disappeared completely under the administration of 30 grains of iodid of potash.

The duration of my cases has been from ten days to three weeks, with the exception of the one referred to, which persisted for six weeks, until the iodid was brought into use, when the improvement was prompt.

Local Measures.—The most satisfactory local application for the relief of pain is the lead and opium solution, U. S. P., applied warm to the parts by means of soft old linen or gauze, over which oiled silk or rubber tissue is placed, to prevent too rapid evaporation, the entire dressing being held in position by bandages.

ERYTHEMA MULTIFORME

As its name indicates, this is a disease of the skin manifesting itself in many different forms.

Etiology.—It is most frequently encountered in ill-conditioned children of rheumatic inheritance, and is frequently associated with disorders of digestion.

Symptomatology.—The disease usually manifests itself in reddened papules, macules, and erythematous, infiltrated skin areas, all of which are most frequently found over the dorsal surfaces. There is no pain and but little if any itching.

Diagnosis.—The condition is to be differentiated from acute urticaria by the fact that in urticaria the lesions are very transient, appearing and disappearing rapidly, while in erythema multiforme several days are required for resolution to take place.

Treatment.—The management consists in relieving whatever digestive derangement may exist by the use of calomel, rhubarb, and soda, and the enforcement of a suitable diet (p. 96).

For a child five years of age 3 grains of salicylate of soda with 6 ounces bicarbonate of soda in 4 ounces of water should be given after meals three times daily. In the event of itching, which is unusual, an ointment composed of 10 grains of menthol in 1 ounce of rose-water ointment will usually furnish relief. The eruption seldom lasts longer than a week. A pigmented area may remain at the site of the lesion.

ERYSIPELAS

Erysipelas is a serofibrinous inflammation of the skin, and may go on to the stage of gangrene. It is caused by the streptococcus, which enters through a wound or abrasion and spreads along the lymph-channels. Strains of streptococcus isolated from the lesion of erysipelas cannot be differentiated by any known test from other strains isolated from a case of scarlet fever or from a suppurating focus anywhere in the body.

In newly born infants the umbilicus may be the point of entrance for the streptococcus, and erysipelas of the surrounding portions of the body-wall may result.

Etiology.—Infants with low resistance are predisposed. Thus a majority of my cases were seen in the New York Nursery and Infant Asylum. Nevertheless, babies ideally cared for are sometimes victims of the infection. The absence of resistance of the young to bacterial invasion is unquestionably a factor in determining the age incidence.

Mode of entrance: In the newly born the streptococcus may enter the skin by the nasal route. Later in development the process may begin in any portion of the skin surface. The scalp perhaps is the favorite site.

Symptoms.—The first sign may be fever, the cause of which is not known until a reddened, indurated area with sharply defined border is found at some point in the body. The infection, when not very severe,

may invade the scalp and continue to spread unrecognized because of the protection of the hair. Usually a considerable area, at least two or three inches in diameter, will be present when the disease is discovered. From this primary area there is a slow progressive spreading of the process, the margins of the affected zone remaining sharply defined. The inflammation may be arrested at any point or it may involve the entire body. The slowly creeping red line of demarcation at all times sharply defines the normal skin from the reddened infected skin and subcutaneous tissue. The portions involved swell to two or three times the normal size. The skin over the feet and hands may be swollen almost to the point of rupture. Severe infections are never followed by recovery. If the case is mild, the general process will be less intense, the creeping extension less rapid, and the response to treatment more prompt, permitting recovery.

The temperature is very high—usually 104° to 106° F.—with but little variation. The height of the temperature is indicative of the severity of the infection. In mild infections only the fever may be slight.

With erysipelas the child is very uncomfortable and restless and cries much, giving evidence of considerable pain, particularly upon manipulation.

Complications.—Erysipelas does not predispose to any particular form of illness. Patients who resist the infection may develop bronchopneumonia as a terminal complication.

More often the digestive system becomes involved, the child loses weight rapidly, and dies from exhaustion.

Prognosis.—Erysipelas is a particularly fatal disease in infants. In the new-born, 95 per cent. of the cases are fatal. Fifty per cent. of my cases occurring in children under one year of age have been fatal. When the streptococcus of erysipelas gains entrance into the skin of an infant, it is unusual for the entire skin surface not to become involved before the process subsides. The long-continued high temperature, the toxemia, the discomfort from the inflammation, and the interference with nutrition so greatly reduce the patient that even if the disease is resisted during the acute stage the subject is very apt to die later from exhaustion.

This was the outcome in four cases recently at the New York Infant Asylum, where each child went through the active period of the disease, but died a week or two afterward from exhaustion and marasmus.

Treatment.—The treatment is unsatisfactory, particularly so in young children. The younger the child, the graver the prognosis. Absolutely nothing is to be promised. I have employed scarifications in advance of the line of the slowly creeping inflammation, and whether solutions of the bichlorid of mercury, carbolic acid, or ichthyol were used as a dressing, I have seen the red line pass the scarified, disinfected surface, regardless of the nature of the antiseptic and regardless of the vigor and vitality of the child.

The termination of the case, whether in recovery or death, depends to a great extent upon the resistance of the patient and the severity of the infection, so that our first step should be to place the child in the best position to resist the disease.

General Measures.—Perhaps the most important factor in the treatment is abundance of fresh air. In the winter the child does best in a room with windows wide open, not for a few moments at intervals, but continuously. Protection with hot-water bags and sufficient clothing eliminates danger, as long as the temperature of the room does not fall below 55° F. At other seasons of the year the patient should, if possible, be kept out-of-doors.

Infants with erysipelas are particularly liable to develop gastro-enteric disorders. In case the child is bottle-fed, the milk mixture should at once be reduced from 50 to 75 per cent. below the normal by the addition of barley-water or granum-water No. 1, so that the amount of fluid given at a feeding remains unchanged.

Internal medication, such as I have used, has been of no value unless stimulating or sustaining in nature. The tincture of the muriate of iron is not to be given young infants with erysipelas, for it almost invariably disturbs the appetite and interferes with the digestion.

In the event of high temperature—above 104° F.—the cool pack (p. 747) may be found effective.

Local Applications.—The local agent which is unquestionably of some value is ichthyol. I prefer a 30 per cent. solution if the involved area is on one or more of the extremities or a small portion of the trunk. Solutions as dressings should not be used for infants when the erysipelatous process involves the face or much of the trunk. When these parts are involved, a dressing of 30 per cent. ichthyol ointment in vaselin should be applied on strips of lint or linen and renewed every three hours. The frequent renewal is important, and the ointment dressing should be used only on the acutely involved areas. When, in a given case, the inflammation begins to subside, the dressings should be removed and the parts bathed freely. In this connection it must be remembered that the skin is an important organ of excretion, particularly of carbon dioxid. The constant covering of comparatively large surfaces on a small body, by interfering with the function of the skin, may become a serious matter. The local treatment with ichthyol should follow up the extension of the inflammatory process and be continued until it subsides. The lotion used for my last three cases was a saturated solution of boric acid kept continually applied on linen as a wet dressing. Every case recovered, probably as a result of the existence of only a mild infection.

Stimulants.—Nearly every infant with erysipelas will require stimulation. For this purpose small doses of whisky well diluted appear best. From 5 to 15 drops at two-hour intervals for children under two years of age has aided me, I am sure, in carrying the patients through to a successful convalescence. Erysipelas is the only disease in which it is wise to use alcohol early, and in many instances as the only stimulant.

Convalescence.—When the inflammation subsides, the child is by no

means to be regarded as well; for even in the absence of sequelæ, such as a phlegmon, endocarditis, or nephritis, vitality may have become so reduced that sudden death may take place when it is thought the patient is well on the road to recovery, such a result being due, perhaps, to an unrecognized myocarditis. During the entire attack and throughout convalescence the child should be fed to the limit of digestive capacity, but never beyond this limit. Correct feeding is possible only by careful observation of the case and frequent inspection of the stools.

Vaccine Therapy.—The value of vaccine therapy in this disease remains to be proved. (See p. 764.)

ECZEMA

In the consideration of eczema we are dealing with a disease which is very frequently encountered in infants. If we group together all the skin diseases of infancy and childhood, it will be found that eczema considerably exceeds in prevalence all the others combined. This is not surprising when we remember the exposed situation of the skin, its delicate structure, and its manifold functions of absorption, secretion, excretion, and heat radiation.

Etiology.—Grossly, eczema as it occurs in infants may be divided into two types: the first, due to causes operating from without the body, including local infection of various kinds or local irritation of whatever nature; the second, due to abnormal systemic conditions affecting the skin through the nervous system or by means of the blood-current. Cases of this latter class are looked upon as of toxic origin. The irritation of the skin or the skin lesion is actually the secondary manifestation of a disordered constitutional state. Upon the non-resistant skin lesion, infection is implanted through exposure to the air or through scratching, and the result is an eczema in which both causes are operative. This is the etiologic explanation of the majority of the cases in patients under two years of age.

In view of the foregoing it is plainly not possible, even were it desirable, to make the attempts at differentiation, such as is found in textbooks dealing with dermatology in the adult. Repeatedly one will find a weeping or catarrhal eczema in one portion of an infant's body and on other portions every variety of inflammatory lesion, including papules, vesicles, pustules, and fissures. Moreover, a weeping surface may be replaced by perfectly normal skin within a day or two and then suddenly return within a few hours under some dietetic indiscretion.

Infection of the involved areas by pyogenic bacteria, resulting in pustules and furuncles, is more common in infants than in adults, because of the child's greater tendency to inoculation through manipulation and scratching, and because of the diminished resistance offered by a child to pathogenic organisms.

Toxic Origin.—The cases of eczema that are due to disordered metabolism or to digestive derangements are the most frequently encountered and by far the most resistant to treatment.

The Age.—The susceptible age is from one to twelve months. While cases which have developed during the earlier months of life may persist into the second and third years, so long a duration is comparatively rare, and it is equally rare for cases to develop after the first year, the latter fact implying that many are cured spontaneously.

Physical Condition.—The physical condition and vigor of the child exert no influence upon the development of the disease. Some of my healthiest nursing babies who have made most satisfactory progress and been well in every other respect have been sufferers from eczema until the nursing period was over or until nursing was discontinued and other food given. In fact, the majority of my cases have occurred in children whose condition was otherwise satisfactory. There have been other patients, to be sure, who have suffered from malnutrition or been difficult feeding subjects. In some of these the eczema was possibly a factor in causing the malnutrition, for on account of the excessive itching and consequent restlessness and sleeplessness, strength had become so markedly reduced that malnutrition was just as probably a result as a cause of the eczema. Nevertheless, a consideration of all the cases encountered indicates that athreptic and poorly nourished children are surprisingly free from eczema of an acute inflammatory type. Whatever process is at fault is usually of such a nature as not to interfere with nutrition.

In a considerable proportion of the cases there will be an associated eczema of the scalp.

Several of my patients who have been sufferers from eczema in babyhood have in later life developed some tendency to cyclic illness, such as recurrent bronchitis, recurrent asthma, or recurrent (cyclic) vomiting. Not a few of my eczema patients have been the offspring of parents who gave a history of gout.

Carbon Incapacity.—While it is not claimed that the presence of carbohydrate and hydrocarbons in the infant's food is the sole cause of these forms of toxic eczema, my observation, covering many hundreds of cases, leads me to believe that a carbohydrate (sugar) incapacity exists in all. I look upon a great majority of the cases as exhibiting incapacity for fats (hydrocarbons) and certain carbohydrate foods, an intolerance which may be manifested by the skin lesions and in no other way.

The ingestion of fats and sugars of the arts is the most prominent etiologic factor in causing eczema in the young. Carbohydrate in the form of baked flours appears to exert but little influence. Orange-juice and beef-juice when given in association with a high sugar diet will precipitate an attack in some children or produce recurrence in a recovered case.

Local Irritation as a Factor.—Traumatic eczema may be produced by any form of irritation, such as woolen worn next to the skin, counter-irritants applied for therapeutic purposes, overclothing in hot weather, or scratching to relieve the itching caused by the bites of insects.

Symptoms.—The symptoms of eczema cover so wide a field that a

description is most difficult. A red inflamed area on the cheek and an extensive acute general dermatitis constitute the two extreme possibilities of the acute lesions. Between these extremes there is every degree of involvement.

When an infection with the staphylococcus supervenes we may expect all possible varieties of pustules and furuncles, and the case may show, throughout, the characteristics of chronic eczema in the adult: dry, scaly, desquamating epithelium on extensive reddened surfaces, or infiltrated skin areas with diffuse macules and papules and abundance of scratch-marks. The extensor surfaces of the arms and legs are the most frequent sites of election by this form.

Prognosis.—Eczema is one of the diseases that require patient and persistent treatment of the right kind. The prognosis is then good, and the results prompt. The disease does not tend toward recovery, particularly during the first year, although many cases developing during the first month get well spontaneously during the second year. In a few subjects the tendency persists during the life-time of the individual.

Treatment.—The management is variable, depending upon several factors.

Management of the Breast-fed.—If the child is a well-nourished, breast-fed baby and presents the familiar picture of the red, weeping cheeks, with dry crustations extending to the forehead and ears, seborrhea of the scalp, and roughened skin over the outer aspect of the arms, my first step is to look into the life and habits of both child and mother. The mother's life and the nursing hours are to be regulated along the lines laid down under maternal nursing (p. 21). A most important requirement of these cases is that the mother's bowels shall be evacuated at least once daily and that the same function shall take place in the baby. In a case of the character described the child has usually been getting too much food, and probably food high in fat. The mother's milk should be examined and the baby weighed before and after nursings for twenty-four hours in order to determine the amount of milk taken at a feeding. As a general observation it will be found that these children do best on four-hour nursings, at 6, 10, 2, 6, and 10 P. M. If the mother's milk is found to contain an excess of fat, one ounce or two of water or barley-water should be given before each nursing to diminish the amount of fat ingested.

For the correction of constipation in the mother I frequently prescribe the following laxative:

℞ Ext. belladonnæ . . . . . gr. iv
Ext. nucis vomicæ . . . . . gr. viij
Ext. cascaræ sagradæ . . . . . ʒij
M. Div. in capsulas no. xxx.
Sig.—One at bedtime.

In every instance from 15 to 20 grains of bicarbonate of soda is given daily to each child for a protracted period.

By applying this form of management to the mother and child I have repeatedly known the eczema to subside very promptly. In

other cases I have seen it improve; and in still others persist without the slightest benefit.

The problem which confronts us may be rendered difficult in different ways. If the child is her first offspring, the mother feels keenly the disfiguring condition and demands a prompt cure. If this is not forthcoming within a few weeks she seeks new medical advice. My advice concerning the persistent breast-fed cases is for the mother to continue to nurse the thriving child and tolerate the eczema. Local treatment should be prescribed to relieve as much as possible the child's distress. The mother may be told that at the time of weaning the eczema will probably disappear. If weaning is insisted upon, the patient forthwith becomes a bottle-fed infant and is treated accordingly. The eczema often, but not invariably, clears up promptly when nursing is stopped.

Management of the Bottle-fed.—Every year I see many aggravated cases of eczema in bottle-fed babies who have been treated elsewhere, often by dermatologists, without benefit. Failure usually has been due to the fact that while a great deal of attention has been paid to local measures, little if any has been directed to the feeding and other details of the constitutional care.

Let it be understood that local applications in the form of lotions, ointments, or powders have but two uses in the treatment of eczema in children. Their chief use is that of a sedative. In other instances a stimulant is required and may be supplied by local measures as a means of permanent cure. Local treatment, however, is attended with disappointment. The external condition may be temporarily relieved in a marked degree, but if the underlying systemic toxic condition exists, the disease returns with renewed vigor.

In caring for the bottle-fed I find that the most prompt results follow when food low in both fat and sugar is given. I specify the use of skimmed milk diluted with a cereal decoction made usually from barley flour or Imperial Granum. Sugar is to be avoided. For a child under one year of age, from 12 to 24 ounces of skimmed milk are added to sufficient cereal water to make 32 ounces. One and one-half ounces of either of the above flours are required. To the day's ration is added from 20 to 30 grains of bicarbonate of soda. The mother or nurse is told that the child is not expected to gain rapidly on this formula. Perhaps no gain will occur for a few weeks, but only a very stubborn case will fail to show some response to the change in the diet. If constipation follows the change in the food, magnesia in some form—calcined, or milk of magnesia—may be added to the day's ration in sufficient amount to keep the bowels relaxed. If the response to treatment is not satisfactory, or if the milk does not agree with the patient, I employ the evaporated milk known in the New York city local market as unsweetened condensed milk, a preparation also available in cans under the name of the Peerless Brand.* In feeding, one part of this milk is added to from three to six parts of the 6 per cent. carbohydrate gruel. Whether ordinary skimmed milk or the special evaporated milk is employed, this method

* Borden's Condensed Milk Co.

of feeding is continued only until the skin condition warrants an increase, and then the change is made to full milk with the gruel diluent. In some instances sugar is not used for weeks. Bicarbonate of soda 20 to 30 grains is always given. In case evaporated milk has been given, the change to plain milk must be made most gradually, one bottle of plain milk replacing one of the feedings of evaporated milk every two or three days. In the event of a return of the eczema, it may be necessary to resume the former diet, consisting of the skimmed milk or evaporated milk, and perhaps to discontinue full raw milk entirely.

Illustrative Case.—One of my patients, a baby otherwise normal, had a most pronounced general eczema, the entire skin surface being involved. For seven months—until he was past one year of age—I was unable to give this patient more than 1 per cent. of fat. An increase to 1.5 per cent. of fat would be followed in half an hour by intense inflammation and redness of the skin.

In another case, almost as severe, which I saw at the ninth month, I was unable to give plain milk in any form. The condition was so aggravated that I discontinued entirely the fresh cow's milk and gave the child only evaporated milk, whereupon the skin cleared up promptly without any other treatment whatever. After about six weeks a further trial of full milk in small quantities was at once followed by a prompt return of the eczema. At different intervals the plain milk was given for one or two feedings daily, but this we were always obliged to discontinue, because of the signs of the old trouble which immediately reappeared after two or three of such feedings.

In treating these obstinate cases, as the urine is usually very acid and a deposit of urates will be found on the napkin, I invariably give bicarbonate of soda, one grain to one ounce of food, or two grains of citrate of potash three or four times daily.

If a high fat feeding has been practised, cure may at times be effected simply by the use of full cow's milk, with the gruel diluent.

Local Treatment.—In view of what has been said, little is to be expected from local measures. As a rule, too strong lotions and ointments are employed and help to keep up the irritation, producing harm rather than benefit. Vaselin is often used as a base, and this in itself is irritating to many skins. In facial eczema of an active type in young infants, however, the parts should be protected from scratching and pillow-rubbing. This is best accomplished by the use of a mask (p. 571) under which are placed strips of old linen on which the following paste ointment is applied:

℞ Pulv. zinci oxid,
Pulv. amyli . . . . . āā ℥ij
Ungt. aq. rosæ . . . . . q.s. ad ℥ij

This ointment should be freshly applied three times daily. The child's skin is not to be bathed with water, but cleansed with sterilized sweet oil. When the weeping has subsided, some preparation of tar may be employed. An ointment composed of unguentum picis, U. S. P., 1 part, with unguentum aquæ rosæ, from 4 to 6 parts (the strength used depending upon the irritability of the skin), may be applied with much benefit morning and evening. The ointment should be thickly spread over old linen and held firmly, yet without great pressure, over the parts. If the existing irritation is at all increased, the amount of tar used must

be diminished. If the itching is not considerably relieved by the application, 5 grains of menthol or 5 grains of salicylic acid may be added to each ounce of the ointment.

Bathing.—All infants and young children suffering from generalized eczema should not be bathed. Water is a decided irritant to the skin. For cleansing purposes during the acute stage sterilized olive oil or liquid albolene may be used. When the skin permits of bathing, the patient should have the advantage of the soda or bran bath (p. 750). Unnecessary friction is to be avoided at all times.

Clothing.—It is my custom to have the clothing which comes in contact with the skin lined with thin linen. Wool worn next to the skin will frequently retard recovery.

Traumatic Eczema.—The successful management of eczema due to external causes consists in the removal of the source of the irritation. In some cases lining the underclothing with old linen or the use of linen mesh underwear will solve the entire problem. Local treatment, when necessary, is afforded by the soothing and stimulant applications previously described.

ECZEMA INTERTRIGO OR ERYTHEMA INTERTRIGO

This form of eczema is an affection resulting from persistent irritation due to moisture or friction. The primary condition of maceration soon develops into a chronic eczema. This occurs with greatest frequency in fat children, but may develop in any child through neglect. In fact, intertrigo is often a mark of ignorance and neglect.

Location.—The parts most affected are the lower abdomen, the inner aspects of the thighs, and the buttocks. In neglected cases I have repeatedly seen the process cover the entire skin surface from the umbilicus to the lower third of the thigh. Other parts usually found affected are the skin folds of the neck, the groin, and axillæ and the flexor surfaces at the elbow-joint where contiguous portions of skin are subjected to chafing.

Neglected, athreptic, and poorly nourished babies afford many of these cases. Among out-patients, I have seen infants who presented a series of linear ulcers in the groin, productive of entire destruction of the skin. In a few such instances resulting infection of the glands in the groin has produced an inguinal adenitis.

Prognosis.—All cases recover promptly if proper care is exercised in carrying out the suggestions offered.

Treatment.—The management consists in separating the opposed diseased surfaces by pledgets of cotton, gauze, or old linen, freely dusted with equal parts of starch and oxid of zinc. As soon as the material becomes moist a fresh dressing should be substituted.

When there is much associated involvement of the skin over the genitals, lower abdomen, thighs, and buttocks, care must be exercised that the parts be kept free from decomposing urine.

Except in cases of the seborrheic type (p. 575) the management consists in neutralizing the urine by the use of bicarbonate of soda,

two grains three times daily, and in protecting the skin surface from irritating discharges by attention to the napkin. Dusting-powders are of very little use.

A most satisfactory procedure which I have followed with success for years, even in the most unpromising cases, is as follows: The mother or nurse is instructed to keep close watch of the napkin and change it as soon as it is soiled. She is further instructed to prepare pieces of gauze or old linen of such shape and size as to cover the denuded surfaces. On these slips of linen she is directed to spread a thick layer of zinc ointment (U. S. P.) to which 10 per cent. white wax has been added. This dressing is kept applied to the parts and is to be changed several times daily. If the ointment is simply spread over the skin, it will soon be absorbed by the napkin and be of no service.

Over the dressing the napkin is placed. The irritating urine is thus prevented by the ointment dressings from coming in contact with the skin. An additional quantity of absorbent cotton placed next to the genitals serves to absorb the urine as it is passed and thus prevents its general distribution over the parts. When the case is well advanced toward recovery, the maintenance of scrupulous cleanliness and the application of a dusting-powder composed of equal parts of powdered starch and oxid of zinc will be sufficient.

Fig. 76.—The Herty mask in position.

The Mask.—The itching produced by facial eczema is often most intense. In order to effect a cure, scratching and rubbing the parts must be prevented. The Herty mask (Fig. 76) fulfils this purpose admirably. The ointment or lotion is placed on clean linen, which rests on the involved parts, and over this is placed the mask, a pattern of which is shown in Fig. 77. Opening A is sufficiently large to furnish space for the eyes, nose, and mouth. An elastic band, passing over the upper lip, draws the sides of the opening together, insuring protection to the cheeks, which are usually most severely affected. B and C pass over the ears to the back of the head, where they are united. The mask, which should be made of muslin or thin old linen, is to be renewed daily.

The Strait-jacket.—The tendency for the patient to scratch the involved parts not only keeps up the trouble indefinitely, but opens a way for the development of severe dermatitis, furunculosis, and cellulitis as a result of infection from the finger-nails. One of the best agents for preventing scratching during the sleeping hours is the Thomas modified

strait-jacket (Fig. 78). This is made of muslin and must be fitted to the patient. The child is slipped into the jacket feet first. The opening A incircles the thorax directly under the arms. The opening B is closed about the neck with the attached tapes. The cord which is used to

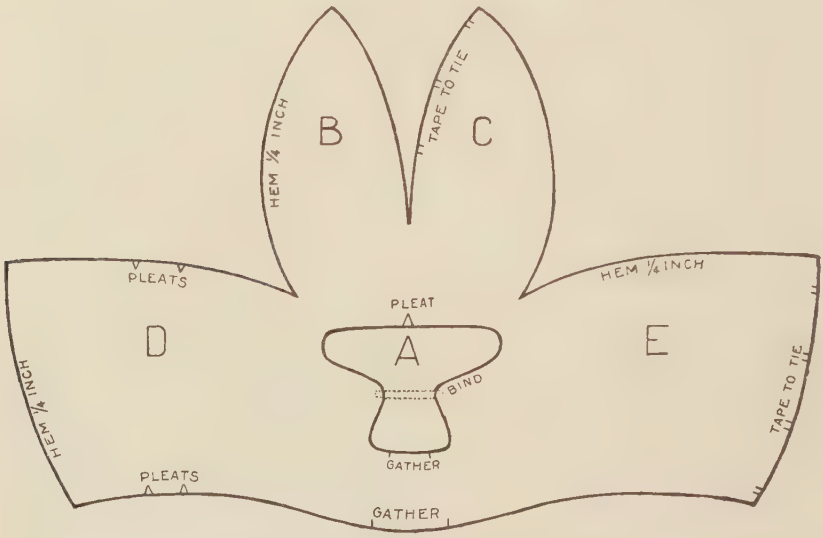


Fig. 77.—Pattern for the Herty mask.

close the end of the sleeves may be tied to the side of the crib or pinned to the bedding. Children readily accustom themselves to lying on the back, a posture which the use of the jacket necessitates.

It is no kindness to allow a child to continue the irritation of surfaces already badly involved.

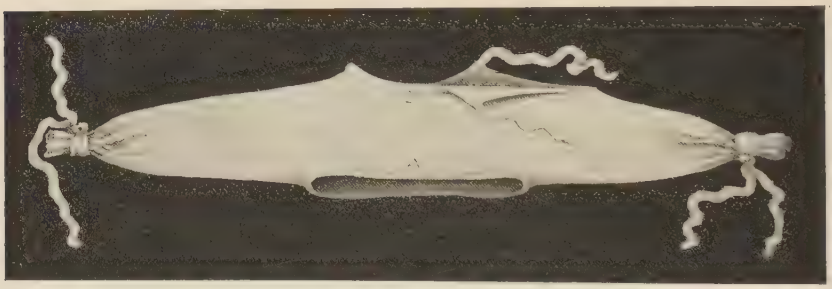


Fig. 78.—Thomas' modified strait-jacket.

ECZEMA IN OLDER CHILDREN

We have been considering eczema in children under two years of age. From the eighteenth month to the second year certain developmental changes take place in the child which render him much less susceptible to

the toxic agents capable of producing the eczema. The ratio of cases seen after the second year to those under one year of age is about one to ten.

Etiology.—Gouty antecedents have been the rule in my cases. In older children as well as in the young, eczema is of metabolic and gastro-intestinal origin. We find that in the causation certain substances play an important part, particularly milk-fats and sugars. Certain fruit acids and meat extractives have also proved operative in an etiologic way. Thus grape-fruit, orange-juice, strawberries, tomatoes and beef-juice have all been proved the immediate cause in a sufficient number of cases to establish the mode of origin beyond the slightest doubt.

Some of the cases of eczema in children are unquestionably of intestinal origin owing to the absorption of toxic substances from the

Fig. 79.—Thomas' modified strait-jacket in position.

intestinal canal. Such origin of the disease may be suggested by habitual constipation, light colored and foul stools, and distended abdomen. This mode of etiology has further been proved by the recovery and continued well-being of the patient when the constipation is relieved and a rational, simple diet free from milk-fat and excessive sugar has been instituted. Finally, it is to be remembered that in older children anemia and malnutrition may play an important part in causing eczema.

Symptoms.—The cases of acute facial eczema are comparatively rare except in younger children, but are occasionally encountered. The tendency to development of pustules and furuncles is also much less in children over two years of age. Weeping and desquamating surfaces, however, are common, and squamous patches and fairly extensive infiltrated areas are frequently found in different portions of the body.

Perhaps the most frequent manifestation at this age is what is referred to by various writers as "neurotic" or "reflex" eczema. The predominating lesions in this form are papules which may exist in great number, especially over the extensor surfaces of the arms and legs. Often the individual papule is tipped by a black speck which represents dried blood and dirt resulting from scratching. In cases that have existed for some months there is a general thickening and hardening (infiltration) of the affected skin, with surrounding spots of inflammation, which is more the result of trauma from treatment than due to the disease itself.

Eczema, by reason of the wide variety of its forms, may involve any portion of the skin. The skin about the umbilicus is one of the sites occasionally selected by the disease in older children.

Illustrative Cases.—One of my most troublesome cases, which had been treated by various physicians for two years, was that of a girl four years of age who presented a round, red, desquamating area on the right cheek, ¾ inch in diameter.

In the case of a boy four years old an acute weeping eczema had covered both buttocks.

A girl of five had suffered at intervals for eighteen months with an eczema between the fingers of the right hand.

I have a most interesting girl patient of eight years, who, after partaking of sugar in any form and in the smallest amount, beef-juice, or any acid fruit-juice, will develop an acute eczema of the face, requiring two weeks for recovery. The mother, who is very intelligent, had discontinued milk before the case came under my observation because of attacks of cyclic vomiting from which the child suffered, and which the mother stated were worse when milk was taken. Milk also produced hives and "poisoned" the child, so that the mother begged me not to ask her to give the patient milk. We found that the child could take fat-free milk. In this case there was a marked history of gout on both sides of the family. The maternal grandmother required crutches, the mother had cyclic vomiting as a child and sick headaches as an adult, and "had been treated for uric acid all her life," and the father stated that he was scarcely ever free from pain in his joints or muscles.

Another girl four years old, of decidedly gouty ancestry, suffered intensely during infancy from eczema, which was with difficulty kept under control. When two years old she developed recurrent bronchitis with asthma of a most severe type, and she has had several attacks of spasmodic croup. Milk-fat, sugar, fruit-juice, or beef-juice in the case of this child produces an intense eczema.

These cases all recovered under dietetic measures alone.

Prognosis.—The prognosis is good, and the results are usually quite prompt following the right line of management. Relapses are not uncommon, however, because the treatment is so largely dietetic, and the best of people, when well, forget dietetic regulations more readily than anything else.

Treatment.—Our first step in the management of eczema in a child is to learn all there is to know about the case. A full physical examination is therefore made and the condition of the blood and urine is ascertained. The child is then given a régime of living suited to his condition. A diet schedule is furnished, the hours for rest and sleep and play are indicated, and if there is defective appetite or anemia, suitable added treatment is prescribed. One full bowel movement a day is required. It has been a matter of no little surprise to me to find the eczema gradually disappearing as a result of improvement in the child's general condition. Through the correction of digestive disorders and the establishment of right living, I have repeatedly seen cases of persistent eczema clear up entirely without other treatment.

In a general way the suggestions laid down for the management of delicate children (p. 134) may apply. In the diet I allow little or no sugar. Milk, if used, is always skimmed. Strawberries, tomatoes, and acid fruits are not allowed. An absolute salt-free diet is not insisted upon, but only sufficient salt is used to make the food barely palatable.

Contrary to the established belief I find arsenic of very little direct value, although in improving the general physical state of the patient it may be of service. I believe rhubarb and soda and cascara to be of much greater value.

Local Treatment.—Local treatment may be of advantage in relieving the itching. In using skin applications for eczema in children it is necessary to exercise considerable care in not having the lotions or ointments too strong, in which event they will act as irritants and do harm. For the acute cases, in which there are much inflammation and itching, I frequently use a combination of zinc oxid ointment, U. S. P., and menthol, as follows:

℞ Mentholis . . . . . gr. x
Ungt. zinci oxidi . . . . . ℥j

After the acute dermatitis has somewhat subsided, the following ointment may be used with advantage:

℞ Acidi salicylici . . . . . gr. x
Ungt. picis, U. S. P. . . . . ℥ss
Ungt. aquæ rosæ . . . . . q. s. ad ℥ij

This ointment should be used twice daily, the strength of the tar and the salicylic acid being increased if necessary as the case progresses. It is always well to begin with an application of a reduced strength and to increase the strength later as the case may require.

The ointment should be bound to the parts so as to completely cover the surfaces, thereby insuring the full benefit of the treatment and at the same time protecting the skin from further irritation by scratching. The case may respond very promptly, or it may be most obstinate and require several weeks of both dietetic and local treatment.

Bathing.—When the skin is acutely involved, water should not be allowed to come in contact with it. Sterilized olive oil should be used for cleansing purposes. On uninvolved portions of the body, and in chronic, inactive cases, the soda or bran bath (p. 750) may be used.

SEBORRHEA

Seborrhea is usually classified as an eczema. It is due to excessive secretion and activity of the sebaceous glands, and is regarded by some observers simply as a derangement of function. By others it is believed to be due to a specific infection.

Seborrhœa Capitis (Milk Crust.)—The form in which the condition is most frequently seen in children develops on the head, producing thick, dirty, yellow crusts, commonly known as "milk crust." The exudation consists of sebum, dirt, and desquamated epithelium. In mild cases the crusts may be isolated or combined in one large patch

with several surrounding smaller areas. In other cases the exudation is thick and uniform, and covers the vertex of the head like a mask.

Treatment.—The first step in the treatment is to remove the crusts. The hair should be cut very short. If only a few areas are involved, anointing the parts with vaselin several times daily will soften the exudate, so that it may be removed. If the crust is thick and extensive, it should be softened with sterilized olive oil, applied on gauze or old linen which is well saturated with the oil, and held in place by a cap of cheese-cloth. If the dressing is applied at bedtime the crusts may often be removed the following morning. In cases in which the exudation has existed for a long time and is very hard, frequent fresh applications of the oil for two or three days may be required to soften the crusts sufficiently for their removal without injury to the skin. When thoroughly softened, they should be washed off with Castile soap and warm water. The underlying skin will then usually be found to be reddish and slightly inflamed. To this should be applied an ointment of resorcin and vaselin, 15 grains to the ounce. The ointment should be spread on linen or lint and applied to the parts with the aid of the gauze cap. In all except the most aggravated cases this treatment, used only at night, will be sufficient. In the severe cases a few additional applications of the ointment during the day will usually be effective. A few days' treatment will often relieve the worst cases of seborrhœa capitis after the scalp has been freed from crusts. I have yet to see a case which will not respond when this treatment is properly carried out. It is to be remembered, however, that there is a tendency for the exudation to return. Mothers and nurses should be instructed to keep the ointment in the nursery for use upon the first appearance of the exudation. In children seborrheic eczema, according to my observation, is comparatively unusual in other portions of the body, although by extension of the seborrhea of the scalp, the forehead and face may be involved. In these situations, also, resorcin is useful, but must be used in much weaker strength, ranging from 0.5 to 1 per cent.

Seborrhœa Intertrigo.—At rare intervals cases of intertrigo are encountered upon which no impression whatever is made by the methods of treatment suggested on p. 570. Several years ago Dr. George T. Elliot, of New York, called my attention to the fact that these cases were of seborrheic origin, and that a change from the ordinary treatment to that ordinarily used for seborrheic eczema would prove his contention. In the cases in question, and in those that I have since seen, the point made by him has been confirmed by the treatment. Cases of seborrhœa intertrigo are generally associated with seborrhea elsewhere, usually upon the head, and show erythema, a tendency to dryness of the skin, and desquamation.

The *treatment* in this form of intertrigo consists in enforcing cleanliness and a proper diet, as mentioned under Intertrigo, p. 570. In addition to the usual means, from 0.5 to 1 per cent. of resorcin should be added to the zinc-oxid ointment which is used as a dressing. Seborrheic eczema, although not as difficult of management as the other forms of

eczema in children, nevertheless shows a great tendency to return, particularly in cases of low vitality.

BED-SORES (DECUBITUS)

During any illness productive of greatly disturbed nutrition or emaciation, such as cerebrospinal meningitis, typhoid fever, and empyema, constant pressure on the prominent bony parts interferes sufficiently with the circulation to cause destruction of the integument. The most frequent sites for decubitus in children are the sacrum, the heels, and the back of the head.

The condition is best prevented by special care in maintaining cleanliness, by keeping the bed-linen smooth, and frequently changing the position of the patient, and by the free application of any simple powder, such as equal parts of powdered zinc oxid and starch.

Treatment.—The parts as they become sensitive and show redness should be bathed several times a day with alcohol. If this does not relieve the condition, the areas should be covered with diachylon plaster so as to insure complete protection. The air-cushion or the water-bed may be necessary in any prolonged illness.

Fig. 80.—Head-rest to prevent bed-sores.

When the back of the head is involved, the scalp should be shaved and the head allowed to lie in a home-made head-rest which is constructed as follows (Fig. 80): A piece of fairly stiff wrapping paper, four inches wide, is twisted into a rope, of which a circle four to five inches in diameter is made by bringing the ends together. The paper is then wrapped thickly with absorbent cotton, which is in turn wrapped with a two-inch roller bandage.

NEVUS (BIRTH-MARK)

A nevus is a congenital new-formation in the skin. The growth may be pigmentary or vascular.

Etiology.—None of the various theories which have been advanced to account for the existence of nevi is well established. The frequent occurrence of vascular nevi in such regions as the back of the head and nape of the neck has given rise to the belief that these marks may be produced by intra-uterine pressure. Virchow, however, emphasized the predilection of the growths for the embryonic fissures of the skin,

where slight irritation would be capable of exciting anomalous vascular development. Females are more frequently affected than males.

Symptomatology.—The pigmentary moles comprise *nævus pilus*, a smooth, pigmented spot; *nævus pilosus*, the hairy mole; *nævus verrucosus*, a raised warty growth; *nævus lipomatodes*, which contains hypertrophied fat tissue; and *nævus linearis*, which is usually unilateral, and frequently follows the distribution of cutaneous nerves. The moles may be brown or black, single or multiple, and are most common on the face, neck, and back.

Vascular nevi range in character from small capillary angiomata to large, raised, pulsating tumors. One of the most disfiguring marks is the *nævus flammeus*, or "port-wine stain." This is a bright red or purple spot, of irregular outline and more or less uneven surface, commonly found on the face, and covering an area which may be as large as the palm. The true vascular nevi all become pale under pressure, and, conversely, show the deepest color when the local blood-pressure is increased by such acts as crying or coughing.

Prognosis.—Pigmentary moles rarely disappear spontaneously. The simpler forms of angioma may, however, occasionally undergo atrophy, or, on the contrary, increase in size over a limited period.

Treatment.—Satisfactory results in treatment call for the exercise of considerable patience and skill. Many of the smaller capillary nevi may be made to disappear under the pressure produced by repeated applications of collodion. In more pronounced cases "stippling" with nitric acid, electrolysis by multiple punctures, and exposure to the *x*-ray are methods of value. Jackson has emphasized particularly the value of freezing by liquid air or carbon dioxid snow. In suitable cases excision may be performed. Mention, however, should be made of the tragic results which have occasionally followed mechanical interference with certain forms of mole. Although it is possible that metastasis with general sarcomatosis is a phenomenon confined to adults, no one who has witnessed such an occurrence will advocate conservative surgery in the removal of pigmental growths. Unless excision can be thorough and complete, it should not be attempted.

XV. DISEASES OF THE EAR

EARACHE

In every case of earache in an infant or young child the ear-drum should be examined. It may show intense congestion and bulging, requiring immediate incision, or only slight congestion about the periphery of the drum and at the tip of the malleus. When the latter condition exists there are various means of relieving the pain, the most effectual probably being instillation into the ear of equal parts of a warm 4 per cent. solution of cocain and camphor-water, five drops of which are dropped into the ear, and repeated every half-hour if necessary, after which dry heat may be applied by the use of a hot-water bottle or a salt bag. I have frequently relieved severe attacks of earache by means of a hot-water douche with one pint of water at 110° F., using a douche-bag or a fountain syringe. When the pain is not promptly relieved, the ear should be carefully watched, particularly if there is recurrent shooting pain, a throbbing sensation, or a feeling of fullness in the ear. In young children a rise in temperature associated with earache is often indicative of an acute infectious process in the middle ear, and, in addition to the treatment suggested, the ear should frequently be examined, in order, if necessary, to insure early incision of the drum membrane.

DEAFNESS

Hearing is probably established in the newly born during the first two or three days of life. During the early months of life the hearing is very acute. Acquired deafness is not at all unusual, however, even in comparatively young children. Among its most frequent causes is an extension of an inflammation from the throat to the tubal mucous membrane. In diphtheria, in the exanthemata, in grip, in tonsillitis, and in many other ailments of early life there is an associated inflammation of the nasopharyngeal structures. Unless infection of the middle ear occurs, deafness is usually of a very temporary nature. Persistent deafness may be the result of enlarged tonsils, adenoids, or organized changes in the canal or in the middle ear. Among the most frequent causes of persistent deafness in children are adenoids, scarlet fever, and cerebrospinal meningitis. Congenital syphilis is an infrequent cause of deafness. Response to treatment in this type is very satisfactory. Deafness at rare intervals follows an attack of mumps and is due to an involvement of the labyrinth. This condition calls for expert otologic treatment.

Deaf children whose condition is not recognized are often accused of inattention and punished when they are slow in responding when spoken to. They make slow progress in school and are considered stupid. Many such children suffer from defective hearing of a pronounced type due often to enlarged tonsils and adenoids.

The management in these cases is to remove the adenoids and tonsils. When relief is not afforded by operation, the child should be taken to an aurist for a careful examination as to the condition of the ears and the hearing capacity.

ACUTE OTITIS

Among the ailments of children few diseases are more frequently encountered than catarrhal or purulent otitis media. It occurs with great frequency in the hospital athreptic and in the institution infant. No age is exempt. I have seen otitis in infants of a few weeks of age. In well-nourished, vigorous older children, it is, with but few exceptions, a secondary infection. In poorly nourished athreptic infants it may occur without other evidence of illness. I have repeatedly found otitis of a low grade in athreptics who lacked the usual signs of fever, discharge, and bulging of the drum. In fact, in a considerable number of cases the otitis was first discovered at autopsy.

Types.—It is customary to divide the cases into two primary types: catarrhal and purulent. Such a grouping is hardly necessary, as most cases of the purulent type if seen sufficiently early present what are described as catarrhal symptoms. If the infection is not severe it subsides or responds to treatment. On the other hand, I have seen cases in which the ears had been frequently examined and in which the inflammation was unquestionably purulent from the onset.

Etiology.—Otitis is caused by the invasion of bacteria into the middle ear.

In the atrophic young infant the low systemic resistance and the patulous Eustachian tube account for the ease with which the infection reaches the middle ear and becomes operative. In older children adenoids and enlarged tonsils comprise the chief predisposing etiologic factors. Influenza, scarlet fever, measles, and diphtheria are the diseases most frequently accountable for otitis. It may follow any infection of the nose or throat; thus we often see cases associated with or following rhinitis and tonsillitis. If a generous growth of adenoids exists in the vault of a throat affected by any one of the above diseases, the chances are more than even that suppurative otitis will develop.

Among a series of 72 private cases which were reported several years ago, 3 were apparently primary in that the condition did not follow and was not connected with any previous abnormal state. One case followed German measles; 4, scarlet fever; 7, measles; and 58, influenza or catarrhal colds.

Bacteriology.—In a series of 47 cases in which bacteriologic examinations were made, the results were as follows:

Streptococci in pure culture	13
Staphylococci	11
Streptococci, staphylococci, and pneumococci	12
Streptococci, staphylococci, and pneumococci	6
Staphylococci, pneumococci, and colon bacilli	1
Streptococci and staphylococci	2
Pneumococci	2

The streptococcus supplies the most dangerous form of infection, and in this type not only are all the symptoms more severe, but there is much greater danger of mastoid involvement and secondary sinus thrombosis.

Symptoms.—Among all the diseases of children none is probably so frequently overlooked as otitis. This is due to the fact that the practitioner invariably looks for pain as a symptom of the disease, and this has been the teaching of the books. In a search of many works on otology I find that the symptoms as laid down comprise almost exclusively the evidences of pain,—earache,—the pain being complained of by older children, or manifested in the very young by vigorous crying, by tossing the head from side to side, by head-rolling, ear-tugging, crying out in sleep, disinclination to rest the head on the affected side, or pain upon manipulation of the ear. In short, we have been taught that there is invariably some manifestation of pain referable to the ear or the adjacent structures in all cases of acute otitis in infants and young children. Such symptoms certainly exist in a moderate number of cases.

The most interesting feature, however, in this series of 72 cases, was the absence of pain or localized tenderness on manipulation in 50 of

Fig. 81.—Hard-rubber ear syringe.

the cases, or 69 per cent. Among those included in the pain group, 22 in number, there were some cases which perhaps should not be so included, inasmuch as there were no signs of pain, as we generally expect to find it. The group included those who were very restless, who slept poorly, and who showed evidence of the relief which followed incision of the drum membrane, so that it was fair to assume that the source of the previous discomfort was the ear. Had we depended upon the signs of pain or local tenderness, in 50 of the cases a diagnosis of otitis at the time would have been impossible. Six were seen in consultation, because of the unexplained, continued fever. Nine had been treated by other physicians who had failed to discover the cause of the continued fever. In none of these had ear involvement been suspected, because of the absence of pain and localized signs.

Fever.—Among the 72 private cases already mentioned in well-nourished children, one symptom was present in all—fever. There was nothing particularly characteristic in the temperature range. In some there were the morning drop and the evening rise. In others the temperature variations were inconstant. With but few exceptions the otitis developed during convalescence from an acute process elsewhere, the ear involvement being suspected because of a persistent elevation of the temperature for which no other cause could be discovered. The

fact that 58 of the cases, or 81.5 per cent., occurred with or followed non-specific inflammatory conditions of the upper respiratory tract, such as tonsillitis, grip, and catarrhal colds, emphasizes the necessity for frequent aural examinations during or following such disorders, particularly when there is an elevation of the temperature, which, in the absence of definite clinical signs, we are apt possibly to attribute to chronic grip, malaria, typhoid fever, or dentition.

Course.—In a small number of cases perforation of the drum occurs. I have known the drum to rupture in one hour from the onset of the ear symptoms, and I have known the drum to remain intact with pus in the middle ear, to the best of my judgment, for ten weeks. In the average case, after a free opening of the drum, the discharge persists from ten to twenty days. In cases due to streptococcus infection the discharge is always more prolonged.

Prognosis.—The prognosis is good if the drum is freely incised and kept open. A certain small percentage of cases which is difficult to determine develop mastoid disease, and a still smaller number become complicated by sinus thrombosis and jugular bulb involvement.

The drum heals most readily. In numerous cases treated by free incision I have found the drum absolutely normal in appearance within three or four weeks after the discharge ceased.

Diagnosis.—Fever without apparent cause should always call for an examination of the ears. Earache is a symptom demanding like attention.

Otoscopic examination settles the diagnosis and is the means of confirming or refuting symptoms of unsolved fever or indefinite pain.

Complications.—The most frequently encountered complication is mastoiditis caused by extension of the infective process to the mastoid cells. The mastoid antrum is separated from the middle ear by a very delicate membrane. In many cases of acute otitis, probably in all cases showing prolonged discharge, the antrum is involved. If, within a minute or two after mopping out the canal, there is a free discharge into the canal, this affords strong presumptive evidence that the antrum is involved, as the small middle ear could not manufacture pus with such rapidity.

Prolapse of the posterior superior wall is another sign of mastoid involvement.

The continuation of high fever in spite of free aural discharge is indicative of mastoid abscess.

If the mastoiditis exists, there may be swelling behind the ear or tenderness on firm pressure over the mastoid, particularly at the tip. Both of these symptoms—pain upon pressure and swelling—may fail us, and their absence is not to be considered in any way conclusive evidence against the presence of mastoid disease. There is no doubt but that in many cases of prolonged aural discharge the antrum is diseased and supplies a large part of the pus. The deeper cells in the bone escape infection.

Treatment.—A small percentage of the catarrhal cases in which

there is congestion of the drum without bulging, will subside under irrigation at two-hour intervals with normal salt solution at 110° F. One pint should be used. A fountain-syringe placed at an elevation of three feet above the child's head affords the best means of irrigation.

Regardless of the age or condition, a bulging drum in the presence of fever calls for incision. No harm is done to the ear by the free incision properly made, while much harm as the result of chronic otitis media and mastoid disease may occur when the incision is delayed.

Operative.—Every practitioner who has children as his patients should be sufficiently familiar with the landmarks of the normal drum membrane at the various ages of early life to differentiate the normal from the abnormal. In the routine examination of the child, in all conditions associated with angina or fever, the ear should be included. In quite young babies an otoscopic examination may show a dull, whitish-appearing drum membrane which, on a superficial examination of the case, might be ignored. In all cases, particularly at this age, when the drum landmarks are indistinct, a cotton-pointed probe should be brushed over the surface, thus removing the epithelial scales which may have lodged there, then perhaps a congested, bulging membrane may be revealed.

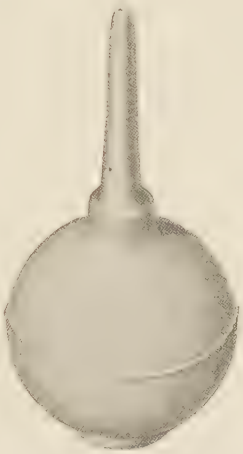


Fig. 82.—Soft-rubber ear syringe.

Conditions or appearances of the drum membrane which require incision are often difficult of recognition by those not skilled in otoscopy. When the drum is bulging, deeply congested in appearance, with landmarks indistinct, an incision is necessary, and should be made in the posterior quadrant, beginning low down and extending upward through Shrapnell's membrane. When also there is congestion of the drum membrane over the tubal entrance, and when the congestion extends toward the periphery, producing, indistinct landmarks without bulging, incision is indicated.

Post-operative.—The after-treatment following incision consists in syringing the ear at three-hour intervals with 8 ounces of a 1 : 10,000 solution of bichlorid of mercury for three or four days, after which the syringing may usually be practised at intervals of from four to five hours until the drum closes. In very young infants if the bichlorid causes a dermatitis at the meatus, it is well to change to a sterile normal salt solution, using the same quantity of fluid. In those cases in which only serum is present at the time of operation, closure in ten days may be expected; if, however, pus is present, from two to three weeks will be required. A sudden stopping of the discharge usually means that the opening in the drum is closed, either through plugging with thick pus or because of too early healing. In either event a reëstablishment of the discharge is required by removing the obstruction or by reincision. The chief factors in prolonging the discharge are adenoids and a lowered state of

physical resistance. After the syringing, the ear should be carefully dried with absorbent cotton. For purposes of syringing a one-ounce hard-rubber ear syringe with soft-rubber tip answers best. If this is not obtainable, a douche-bag, at an elevation of not more than three feet above the patient's head, may be used. The douche-bag sometimes answers better for those who are unskilled, or a soft-rubber bulb syringe of a capacity of one or two ounces may be used (Fig. 82). The small, double-current ear-irrigator may be used with advantage for the reason that it largely prevents wetting the patient. During treatment by any of these methods the child rests on his back with his hands pinned to his side by means of a large bath towel, while a pus basin is held under the ear to catch the flow (Fig. 83). If the nurse can have an assistant, the upright position may be used.

Fig. 83.—Syringing the ear.

Delayed Resolution.—In a certain number of cases resolution is delayed and the discharge continues. In such cases a decided aid is furnished by the use of stimulating and disinfectant instillations. After the last syringing for the day the canal should be dried by the use of a wick of absorbent cotton. Five drops of the following solution are then to be instilled into the ear:

℞ Pulv. acidi borici ..... gr. xxv
Spts. vini rect.,
Aquæ ..... āā ℥ss

McKernon, of New York, advises the use of a 15 per cent. solution of argyrol in a similar manner.

CHRONIC SUPPURATIVE OTITIS

Not infrequently cases come under our care in which there is a purulent discharge from the ears, often most offensive, with a history that the discharge has followed measles, scarlet fever, or grip, and has continued for weeks or months. Examination may show a perforation of the upper portion of the drum, through which there is a free discharge, which, however, on account of the site of the perforation, is not sufficient to drain completely the middle-ear cavity. In other instances the examination may disclose only a small perforation, too small for effective drainage.

Treatment.—In either case incision should be made and free drainage established. The ear should then be syringed (Fig. 83) at least three times a day with a 1:10,000 bichlorid solution. The instillation of a solution of argyrol and boric acid (see p. 584) may also be used with decided advantage. In cases of chronic suppurative otitis it is well to examine for adenoids, as these growths in the nasopharyngeal vault help to keep up ear-discharge indefinitely. The presence of dead bone and granulations is also to be considered in the chronic suppurative cases. When the presence of dead bone or granulations is established, the condition calls for radical procedures by a skilled otologist in order to avoid mastoid and intracranial complications.

In long-standing cases, especially those due to staphylococcus infection, the administration of an autogenous vaccine sometimes is attended with excellent results.

MASTOIDITIS

Because of the ease with which pus may enter the mastoid antrum the complication of mastoiditis is of frequent occurrence in acute aural diseases. Streptococcal infection of the middle ear predisposes to mastoid involvement. Delay in incising the drum and establishing free drainage in acute otitis is also a factor in not a few cases. Finally, as an underlying cause of mastoiditis should be mentioned the child's lack of general resistance to bacterial infections.

Symptoms.—Mastoid disease may be looked for in all cases in which an elevation of the temperature continues in spite of free discharge through a well-opened drum. Tenderness on pressure is a valuable sign, but its absence does not preclude mastoiditis.

Prolapse of the posterior superior wall and the rapid appearance of pus in the canal after thorough cleaning are to be looked upon as most important symptoms.

When there are tumefaction and swelling of the soft parts behind the ear, called perimastoiditis, the mastoid cells and antrum will almost invariably be found involved. In about 10 per cent. of the cases both mastoids will be involved.

Complications.—The complications are sinus thrombosis, jugular involvement, septic meningitis, and pyemia. I have seen all these most serious complications in not a few cases, and have cause to regard the

presence of pus in the mastoid cells or even in the middle ear in children as a matter of serious import.

Treatment.—The radical operation, and that early, is the only treatment for the condition. Children have unquestionably recovered from mastoid disease without operation, but expectant procedures are fraught with great danger and should not be countenanced if the child is in condition to admit of operation.

SINUS THROMBOSIS

In a small percentage of cases of mastoiditis there is a secondary infection of the lateral sinus.

Symptoms.—Sinus involvement will usually be indicated by rapid and wide variations in the temperature. The rise is very sudden, and may reach 106° F. I have seen a rise of 10 degrees in two hours; the fall may be correspondingly rapid, and a peculiarity of the temperature phenomena in sinus disease is the extent of the fall. I have repeatedly known the fever to drop to 96° F.

A confusing and misleading circumstance in these cases may be the absence of signs of great prostration. When the temperature is high, the child appears very ill; when the fever subsides, the patient brightens, perhaps plays, and is interested in his surroundings. It is difficult to reconcile the patient's demeanor with so grave a disease. The misleading behavior, in my observation, has been the occasion of delaying operative measures until such means proved of no avail.

Leukocytosis and a high polynuclear count are usually present. I had one case, however, in which the polynucleosis was not above 60 per cent.

Bacteremia is usually present. Its absence, however, does not preclude sinus disease.

Treatment.—The treatment is the radical operation, with resection, if necessary, of the jugular vein.

XVI. THE TRANSMISSIBLE DISEASES

In this division of diseases are included those which may be transmitted from the diseased to the unprotected individual.

Diseases Which May be Transmitted Through Association.—Syphilis, diphtheria, gonorrhea, stomatitis, tuberculosis, pneumonia, scarlet fever, measles, German measles, mumps, small-pox, chicken-pox, pertussis, poliomyelitis, meningitis, acute cerebrospinal meningitis, plague, typhus, influenza.

Diseases Which May be Transmitted Through an Intermediary.—Gonorrhea, typhoid fever, malaria, yellow fever, tuberculosis, cholera, plague, stomatitis, typhoid fever, scarlet fever, diphtheria, measles, chicken-pox, pertussis, syphilis, plague, and typhus.

It will be observed that some of the foregoing diseases are transmissible in more than one way.

Syphilis, in addition to being transmissible through association, is transmissible by inheritance.

Gonorrhea is transmissible through association and through intermediary objects. That the latter mode of conveyance is common is absolutely proved by the spread of the disease in institutions and hospitals, through the use of the thermometer or at the hands of attendants.

Among the diseases grouped as transmissible through association, in which such transmission is eminently a feature of the disease, are those that usually have been designated as *contagious, e. g.*, scarlet fever, diphtheria, measles, German measles, mumps, small-pox, chicken-pox, and pertussis.

Among the diseases transmissible by intermediary means, gonorrhea has been referred to.

Typhoid fever is usually water-borne or food-borne by flies. Malaria and yellow fever are carried by the mosquito.

Cholera is usually a water-borne disease.

Plague may be transmitted through any intermediary which has been in contact with the infected subject.

Stomatitis, a comparatively insignificant disease, may be transmitted through nipples, pacifiers, or toys that have been in the mouth.

There is quite an unanimity of opinion that scarlet fever, diphtheria, measles, chicken-pox, mumps, small-pox, and pertussis may be transmitted from the diseased to the unprotected individual through the agency of an intermediary person or object. My own observation corroborates this view. At the same time I am sure that such transmission is less frequent than is generally supposed.

The usual means is through association with an individual who has the disease, perhaps in so mild a manner that it has not been recognized.

These diseases, viz., scarlet fever, diphtheria, measles, chicken-pox,

pertussis, German measles, and mumps have another feature in common. They may be extremely severe, or so mild that the case is not recognized, and the patient associates as usual with his fellows. It is to these mild cases that the spread of the disease is due rather than to a transference of the contagium through unusual channels.

It has been estimated that 1 per cent. of children in cities have viable diphtheria bacilli in their throats.

Scarlet fever, because of the possible variation of its course and the indefinite rash, is overlooked more frequently than any other of the diseases of this class. It is not at all unusual for school inspectors to find children, with active scarlet-fever desquamation, in attendance at schools.

I have seen a case of chicken-pox in which there were but five vesicles without other sign of illness, and patients with unquestionable pertussis who never whooped.

The last-mentioned group are referred to in the chapters which immediately follow. For reasons of greater convenience some of the transmissible diseases are described elsewhere.

CARE TO BE EXERCISED BY THE PHYSICIAN IN VISITING INFECTIOUS AND CONTAGIOUS DISEASES

As a rule, physicians in attendance upon contagious diseases are grossly negligent as to the use of proper precautions against the possibility of themselves becoming bearers of infection. The physician who, without washing his hands, makes a practice of going from a child ill with diphtheria or scarlet fever to patients otherwise afflicted, is a source of great danger in any community. During the proper care of a patient, close contact is necessary, particularly in the treatment of throat and nose cases. Not only the physician's hands, but his clothing as well, may become infected. Therefore, before entering the room in which there is a contagious disease he should remove his coat and turn up to the elbows the sleeves of his shirt. If a clean gown is not available, an ordinary clean bed-sheet will answer, this being so adjusted as to protect the clothing, and held in position by two or three safety-pins. My custom, when attending contagious diseases, is to keep in an adjoining room or closet a gown which I wear while in the sick-room.

After leaving the patient the physician should thoroughly wash his hands with hot water and soap, outside the sick-room if possible. An excuse may be offered for not wearing the gown, but there is none for not removing the coat and cuffs, nor for the failure to use the sheet, as suggested; and none for the failure thoroughly to wash the hands after leaving the patient.

VARICELLA (CHICKEN-POX)

Chicken-pox belongs to the transmissible diseases, and is usually transmitted by association contact, rarely through an intermediary. The contagium of varicella is present in the fluid contents of the eruptive vesicles, and also in the crusts resulting from the drying of the vesicular

contents. Consequently the period of transmissible infection persists as long as any crusts remain on the skin. The exact nature of the specific etiologic factor of this disease is still unknown.

Incubation.—The period of incubation is rarely less than eighteen days or longer than twenty-five days. In the majority of my cases it has ranged between twenty and twenty-five days.

Symptoms.—Prodromal symptoms are rarely of sufficient severity to warrant complaint or give evidence of illness on the part of the child. In severe cases there may be slight temperature and muscle soreness.

The temperature rarely goes above 102° F., usually not over 100° F.

The Rash.—The eruption is usually the first important sign of the disease. The back and abdomen are the sites ordinarily involved early. The rash may appear on any portion of the body. It occurs abundantly on the scalp. Usually there are a few spots in the mouth.

Character of Rash.—Not infrequently from the onset it is distinctly vesicular, without any associated skin inflammation, resembling drops of water that may have been sprinkled carelessly over the skin surface.

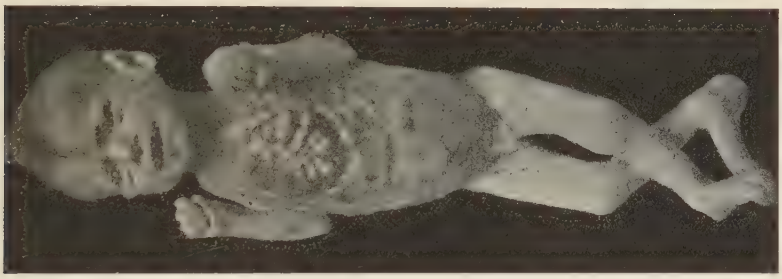


Fig. 84.—Deep ulceration in case of dermatitis gangrenosa infantum following chicken-pox.

More frequently the rash consists of macules, then papules, and later vesicles resting on well-defined red areolæ. At first the vesicles contain clear fluid and vary in size from mere points, scarcely discernible to the naked eye, to lesions ⅛ inch in diameter. In a few hours the serum becomes cloudy and purulent. In from twenty-four to seventy-two hours the fluid is absorbed, leaving the erupted area slightly umbilicated, so that on further drying this forms a crust or scab. These crusts fall off in from one to three weeks, leaving a distinctly reddish skin area, at the site of which there is sometimes a temporary scar. The rash varies greatly in its intensity. Most of the lesions do not go through the characteristic stage just mentioned, and many do not go beyond the papular stage. All stages of the eruption may be seen at one time in any well-marked case, for the reason that the rash appears in successive crops, of which there are usually three, although there may be more. The first crop may be in the scabbing stage when the third or a later crop appears. The amount of rash is extremely variable. In one of my cases there were but three vesicles. In three others, all institution cases, so severe and extensive was the rash that it re-

sulted in a gangrenous dermatitis consisting of clearly punched-out ulcers. The gangrenous area, coalesced, with destruction of large areas of the skin surface. These three cases were all fatal.

Complications.—Erysipelas was a complication in two cases; gangrenous dermatitis in three. Nephritis, although rare, may develop. One of the worst cases of acute glomerular nephritis which I have had occasion to treat occurred as a sequel of chicken-pox. Furunculosis due to infection by scratching is a quite frequent complication in children's asylums.

Duration.—The duration of an attack, from the beginning of the period of eruption until the skin clears, is about three weeks, but may be longer. In mild cases the skin may become clear in two weeks.

Quarantine.—The child should be kept in quarantine and not allowed to come in contact with unprotected children until three weeks have elapsed, or until the skin is free from crusts.

Prognosis.—The prognosis is good. It is very unusual for the most delicate child to succumb to the disease. The institution infants who developed gangrenous dermatitis were the only fatal cases to come under my observation.

Treatment.—Chicken-pox is a disease for which very little treatment is required. During the eruptive period, and until the period of vesiculation is passed and the crusts have formed, the child should be kept in bed.

During the stage of active eruption the tub-bath should be omitted. Instead, gentle sponging with a tepid solution of boric acid—two heaping tablespoonfuls of boric acid to one-half gallon of boiled water—will answer the purpose of cleanliness for a few days. After the daily sponging, and several times during the day, the areas affected should be anointed with a boric-acid ointment made with cold-cream as follows:

℞ Mentholis ..... gr. x
Pulveris acidi borici ..... gr. c
Unguenti aquæ rosæ ..... ℥ij

The ointment effectually relieves the itching, and doubtless is of value in preventing local skin infection through scratching. An equally effective remedy, but one less agreeable for domestic use, is a lotion of 5 per cent. ichthyol and sterilized olive oil. This is to be applied to the entire body twice daily after the bath. Objections to its use are the odor and the staining of the clothing and bed-linen. Permanent scars at the site of the vesicles are so rarely seen that no special precautions are required on this account.

MUMPS (EPIDEMIC OR SPECIFIC PAROTITIS)

Mumps is a specific infection of the parotid glands.

Etiology.—Laveran and Catrin isolated a diplococcus from the exudate of the inflamed parotid gland in cases of mumps. Other observers have described the same organism. It is present not only in the parotid, but, in the majority of cases, in the blood as well, and it has been found in the testicle in cases of secondary orchitis. By injecting pure cultures

of this Gram-positive diplococcus into Steno's duct, Herb was able to produce an acute, uniform enlargement of the parotid gland in the monkey and in the dog. The swelling was accompanied by slight fever, an increase of mononuclear leukocytes in the blood, and a rise in the opsonic index to the diplococcus.

Mumps affects chiefly the runabout and school-children. Infants and very young children rarely have the disease.

Transmission.—The disease may be conveyed by direct contact or through intermediary individuals, books, toys, or clothing.

Incubation.—The period of incubation is long—from three to four weeks.

Duration.—The duration of the disease from the commencement of the swelling until it has completely subsided is from ten days to two weeks.

Quarantine should be maintained until the swelling has entirely subsided.

Pathology.—As the great majority of cases recover, it has been difficult to study the pathology of the disease. The pathologic changes that are known to occur are ordinarily limited to the salivary glands. The inflammation begins as a catarrhal process in the duct. The glandular epithelium is unaffected, but there is an infiltration of the interacinous and periacinous connective tissue.

When mumps affects the testis, the inflammation assumes a parenchymatous form, and when the epithelial degeneration in the tubules is severe, atrophic changes in this gland may follow. Occasionally the orchitis is accompanied by urethritis, edema of the scrotum, and inguinal adenitis.

Ovaritis and mastitis complicating mumps have been observed. Acute pancreatitis has been reported.

Symptoms.—Usually one gland is affected at first, and the gland first affected is usually the one most prominently involved, the second gland rarely reaching the size of the first and subsiding much sooner. In some cases, three or four days intervene before the second gland shows the characteristic swelling. The submaxillary glands may be involved in the process, but usually escape. In one of my patients the submaxillary glands alone were involved. In a very recent case in a child three years of age both parotids and submaxillary glands and the sublingual gland showed massive involvement.

Involvement of other salivary glands than the parotid is more frequent during cold weather.

There may be prodromal symptoms of fever and languor. Difficulty is experienced by the patient in working the jaws. Not infrequently there are sharp neuralgic pains and pains referred to the ear. An elevation of the temperature is usual during the acute stage, although this may not exceed 100° F. In most instances it will not exceed 102° F. If the glands are involved at two or three days' interval, there may be two distinct rises in temperature. The temperature is rarely sufficiently high to demand special treatment.

Diagnosis and Differential Diagnosis.—The patient presents a characteristic picture, the face taking on a rotund, rather ludicrous appearance, produced by no other malady. Acute adenitis of the lymphatic glands at the angle of the jaw is most frequently mistaken for mumps. Mumps, on the other hand, is not mistaken for adenitis.

In history taking, not infrequently one is told that the child has had two or three attacks of mumps, which means that the child has had perhaps one attack of mumps and several of acute adenitis. In mumps the swelling, by involving the parotid, which it will be remembered is in front of and below the ear (Fig. 85), displaces the lobe upward and outward and completely fills the depression posterior to the lobe. In adenitis (Fig. 49) there is usually a well-marked depression between the swelling and the adjoining parotid.

Fig. 85.—Mumps.

Complications.—Complications in mumps are exceedingly rare before puberty. Orchitis may occur in boys and ovaritis in girls, but only very exceptionally if the patient is kept in bed. Infection of the parotid other than that produced by the specific poison of mumps is extremely rare. Abscess as a complication due to a mixed infection has been reported. Nephritis is an occasional complication. I have seen one such case in a boy two years of age. I have never observed complicating pericarditis, endocarditis, or pancreatitis, although such complications have been reported.

Prognosis.—The prognosis is good. I have never known a second attack, a relapse, or a death from the disease.

Treatment.—During an attack the child should be kept in bed until

the temperature is normal, and should remain in the house until the swelling has entirely subsided. He should receive a reduced diet of broths, gruels, and milk, as in any illness with fever. Fruits and acids should not be given because of the discomfort they occasion. Unless the bowels move daily without assistance, citrate of magnesia or a Seidlitz powder should be given.

Warm applications at times relieve the pressure and discomfort. Flannel moistened with warm camphorated oil and bound to the parts has been acceptable to many patients.

WHOOPING-COUGH (PERTUSSIS)

As an infectious disease of importance, pertussis may be classed with diphtheria and scarlet fever. It is probably the cause of more deaths today than is any other infectious disease. It does not kill directly through the means of a specific poison, as do diphtheria and scarlatina, but on account of its prolonged course and its many complications is equally effective as a life-destroyer.

History.—Whooping-cough has existed from early times, under such names as "tussis perennis," "tussis infantum," "chink cough," "chine-cough," and "king's cough." In a treatise published in 1773 William Butter, of Edinburgh, aptly describes "kinkcough" as "a quick and numerous succession of violent, short coughs followed by a long, strait, and generally shrill inspiration, which coughs and inspiration are repeated without intermission for many seconds or often some minutes, and often terminate in the vomiting of phlegm." Robert Watt, writing in 1813, states that "next to the small-pox formerly, and the measles now, chincough is the most fatal disease to which children are liable."

The seat of the affection was variously placed by the early writers in the nervous system, in the digestive organs, and in different portions of the respiratory tract. Butter believed that "miasms generated in the guts, act on the nerves" and "increase irritability." Further information is proffered in statements that "measles render the kinkcough very dangerous"; "small-pox either cures or palliates"; and that "hemlock cures the kinkcough in a week." A critic of the hemlock therapy ironically recalls that "the flesh of fryed mice . . . has been in vogue as a specific." Certain it is that even in very recent years no disease has been treated by remedies of wider diversity. Partial explanation of this fact undoubtedly rests upon the frequent association of whooping-cough with other diseases, as well as upon the varying therapeutic requirements of its more common complications.

Bacteriology.—The bacillus described by Bordet and Gengou in 1906 is at present generally accepted as the probable cause of pertussis, although absolute proof of its etiologic specificity is not yet complete. The bacillus is a short, ovoid, polex, regular, non-motile rod, which does not stain by Gram's method. It is best isolated upon plates of potato-agar mixed with rabbit's blood, as described by Bordet and Gengou,

but later generations grow readily upon plain agar. The bacillus is present in the sputum in enormous numbers, and almost in pure cultures on the first two or three days after the onset of the whoop, and it may be found several days before the spasmodic stage begins (Wollstein). At the end of the first week of this stage, however, other bacteria, such as pneumococci and staphylococci, have usually become so numerous that isolation of the bacillus is impossible. Agglutination reactions with the patient's serum are irregular and unsatisfactory. Complement fixation tests have been reported positive, but they are not regularly so.

Jochmann and Krause found the influenza bacillus in the sputum of pertussis patients in 100 per cent. of the cases they studied. It may be present there before the whoop develops (Wollstein), and it may remain for a period of six months after the attack has ceased (Davis), thus making of these patients influenza-bacillus carriers.

In children who have died during the spasmodic stage of an attack of pertussis the Bordet-Gengou bacillus has been found in the heart's blood and also in the lungs, where Bacillus influenzæ is usually present as well.

Pathology.—There is very little characteristic pathologic change in pertussis. There is an inflammation and infiltration of the mucous membrane of the larynx and upper trachea, which is doubtless the seat of the specific infection.

Transmission.—Transmission, as with most of the communicable diseases, is by means of direct contact. That pertussis may be conveyed through the medium of clothing, a book, a toy, or a second person is exceedingly doubtful.

Extreme youth offers no protection, as in the case of scarlet fever or diphtheria.

Infective Period.—The disease may be transmitted from the beginning of the catarrhal stage. The duration of the period of infection is not known. It probably continues in the average case until the child ceases to whoop.

When pertussis breaks out in a school or in an institution for children, prevention of an epidemic is practically impossible, because the disease is infectious during the early catarrhal stage, which lasts from one to two weeks. During this time the only symptom is a cough and perhaps a slight degree of bronchitis, such as exists with a common cold.

Susceptibility.—The previous state of health appears to exert no influence upon the patient's susceptibility. The strong and the delicate are alike predisposed to infection. The very young and the adult are less liable to take the disease than are children between the fourth month and the third year. This period is the most susceptible time of life. Cases have been reported in children one week old. Any other concurrent infectious disease exerts no influence upon the course of the pertussis. The theory has been advanced that the advent of diphtheria or scarlet fever during an attack of pertussis shortened and modified the course of the disease. My experience does not corroborate this belief. Other affections which occur during an attack simply increase

the burden to be borne by the patient. The largest number of cases develop during the warmer months—from May to November. This circumstance may be accounted for in part by the fact that during the warm period of the year the infected child comes more frequently in contact with unprotected neighbors. The same circumstance, however, tends to disprove that catarrhal affections of the respiratory tract predispose to the disease, since respiratory affections in the young during the warmer months are notably rare. The normal healthy mucous membrane offers no greater resistance to pertussis than does that which is affected by disease. In the early stages of pertussis there is not simply a bronchitis, but a catarrhal process due to a specific infection.

Interesting observations relative to susceptibility to measles and pertussis were made by Biedert. After a lapse of sixteen years both these diseases broke out in a German village at about the same time. There were 401 children in the village under fourteen years of age. These children had never been far from home, and not one of them had had either measles or pertussis. Of this number, 344 became ill with measles and 366 with pertussis, 340 having both diseases at once. The susceptibility of these unprotected children to pertussis was, therefore, 95.5 per cent.; to measles, 85.8 per cent. Of those who escaped pertussis, 7 were under five years of age, 4 between five and ten years, and 9 between ten and fourteen years.

Incubation.—The period of incubation is difficult to determine. It seems to range from seven to fourteen days.

Symptoms.—At the outset the cough may be short, hard, and of a paroxysmal nature. Usually, however, the cough is in no way characteristic and does not differ from that which accompanies bronchitis or tracheitis. Instead of improving under treatment, this symptom becomes more severe and more frequent. The child coughs more at night, usually, than during the day. In a week or ten days, rarely less than a week, the characteristic whoop occurs.

Complications.—The complications of pertussis are many, and account for the fact that the disease is so destructive to life. The mortality of pertussis is generally estimated at 4 to 6 per cent. That it is actually much higher is well known to every one who has seen much of the disease. The most fatal complication in winter is bronchopneumonia; in summer, gastro-enteric disease. Convulsions are not an infrequent complication, and may be fatal. Malnutrition often follows a severe attack in delicate, bottle-fed children, thus paving the way for intercurrent disease. Tuberculosis not infrequently follows a prolonged attack of pertussis. Blindness, deafness, and motor disturbances have all been observed during attacks of pertussis, and have been followed by complete recovery. These cases may be explained as follows: During a severe paroxysm the cerebral circulation is greatly disturbed, and as a result of a moderate congestion or venous hyperemia, there is a disturbance of nutrition in certain portions of the brain. On the cessation of the paroxysm these symptoms all disappear.

Diagnosis.—The diagnosis of pertussis is most difficult in the early

stages, before the whoop or convulsive paroxysm develops. Even a spasmodic cough does not always mean a developing pertussis.

In rachitic children, and in those in whom the nervous element is prominent, the cough of an ordinary cold is often of a decidedly paroxysmal character, especially when there is an acute or subacute laryngitis.

The cough, however, if more troublesome at night, favors a diagnosis of pertussis. If the diagnosis is correct, the cough grows steadily worse and resists all treatment.

The mild cases are also difficult of diagnosis.

Illustrative Cases.—Recently two patients, aged eight and ten years respectively, went through an attack of pertussis with but two or three severe paroxysmal coughing attacks.

Two other cases seen in private practice also show how mild may be the course. The patients, brother and sister, aged six and eight years respectively, commenced coughing about ten days after exposure. The cough was paroxysmal, with from three to five seizures in twenty-four hours. The boy whooped only three times during the entire course of the disease; the girl did not whoop at all. Vomiting never occurred with a paroxysm. Both patients coughed for six weeks. They had neither adenoids nor bronchitis.

Often the very young and the very delicate do not whoop, even during a severe attack. Among the severe cases convulsions and hemorrhage from the nose, ears, and eyes are seen from time to time. A very severe seizure in a girl nine months old was followed by small extravasations of blood into the skin of the entire body.

Differential Diagnosis.—In all cases of severe cough of uncertain origin the nasopharyngeal vault must be examined for adenoid growths. In young children this can be properly done only by the use of the index-finger.

The presence of a persistent cough with a paroxysmal tendency, in the absence of local respiratory irritation of any nature, is very suggestive in a suspected case.

Prognosis.—Pertussis in children under eighteen months of age must ever be regarded in a serious light. Delicate and rachitic children should be carefully guarded against the disease. Bronchopneumonia and gastro-enteric troubles are the most frequent complications among this class of children. The majority of healthy children over eighteen months of age bear whooping-cough without great inconvenience.

Treatment.—In considering the management of pertussis we are first to remember that the disease is self-limited, that it cannot be cured by treatment, and that, in common with the other infectious diseases, it can only be made as easy as possible for the patient to bear. We cannot shorten the attack, but we can lessen the number and severity of the paroxysms. This is to be accomplished by the use of drugs administered by the mouth. The believers in the theory that the chief seat of trouble is in the nose have advocated and brought into use the insufflation of various kinds of powders, prominent among which are boric acid, resorcin, and ground coffee. This treatment, as might be expected, is of no service.

During a three years' epidemic of whooping-cough in the Country Branch of the New York Infant Asylum, from 60 to 90 children were constantly in quarantine. New cases developed about as rapidly as the old ones were discharged. During the epidemic children were quarantined who did not have the disease. On the other hand, an early diagnosis was frequently made before the onset of the spasmodic stage, by excluding all possible causative factors, such as pharyngitis, laryngitis, and bronchitis.

The cases as they developed were divided into groups of 20. The patients were allowed to cough untreated until the height of the paroxysmal stage was reached. This usually required from ten to fourteen days from the commencement of the cough. Careful record was kept day and night of the number and severity of the paroxysms. When there was no increase either in number or severity for three days, we believed the height of the paroxysmal stage had been reached, and the drug selected was brought into use. The ages of the cases treated varied from six weeks to twenty-six years. Only three patients had reached adult life. Five-sixths of the patients were under four years of age. One-half were under two years. The duration of the attacks ranged from three to twenty weeks. A period of six to eight weeks was the usual duration. In several cases the attacks were so mild that a diagnosis was difficult.

Drugs.—The drug treatment consisted in insufflations, internal administration, and inhalations. Other treatment consisted in the use of the steam spray and fresh air. Resorcin and boric acid combined with bicarbonate of soda were used by means of insufflations in six test institution-cases, and discontinued after three days as impracticable and useless. Inhalations of "Vapo-cresolene" were used in 10 other institution cases without apparent effect in modifying the disease. In private practice "Vapo-cresolene" has sometimes a decided sedative influence upon the disturbed nervous state of the parents and does not harm the child! It has been used with my permission in many private cases. Medicated steam inhalations, creasote, turpentine, and wine of ipecac were used in many cases with decidedly beneficial results. The cases selected for the inhalations were those of the very young and delicate, with a complicating bronchitis. The steam was used in connection with other treatment. The drugs selected for internal administration were alum, fluidextract of horse-chestnut leaves, dilute nitric acid, hydrochlorate of cocain, bromoform, quinin, the bromids, belladonna, and antipyrin.

The fluidextract of horse-chestnut leaves and dilute nitric acid were each used in 20 test institution-cases. After a trial of five days they proved valueless or objectionable on account of the vomiting produced, and were then discontinued. Alum appeared to be of some service, but was badly borne by the stomach. Bromoform was used in 16 dispensary and in 6 private cases. In 3 only did it appear to be of service.

One-tenth grain of hydrochlorate of cocain every four hours for a

child two years of age was employed in 23 dispensary and in 5 private cases. It possesses some value in controlling the severity of the paroxysms, but the results were not sufficiently marked to warrant its further use.

Quinin has been used in a large number of cases in both private and out-patient work. I find that great benefit may be derived from its use if a large amount can be given. Its administration, however, is attended with difficulties. Twelve to 20 grains in twenty-four hours are required for pronounced results in children from two to six years of age, and the administration of such a large amount is not favorably received by many parents. Again, our inability to make the drug palatable is a serious drawback for any age, and almost excludes its use in the very young; furthermore, in the very young and delicate quinin may derange the stomach and produce vomiting. The best form of solution to use is that of the bisulphate in Yerberzine (Lilly). In older children, when quinin can be given in sufficient quantities in capsules, the decrease in the number and severity of the paroxysms is sometimes surprising.

Belladonna was used in 60 test institution-cases. Its use was begun at the height of the paroxysmal stage. It was administered to the point of physiologic effect for a period of from five to seven days without influencing a single case of whooping-cough in the slightest degree. True, the cases were all severe, but they responded promptly to the other means used later. The children were all between three and seven years of age. I have repeatedly seen these children with dilated pupils and the characteristic belladonna blush grasping a crib or a chair for support during a paroxysm that furnished an ideal clinical picture of the disease.

Equal quantities of the bromids of sodium, ammonium, and potassium were used in 60 test institution-cases. The results, considered from all standpoints, were better than with any of the means of treatment thus far referred to. The severity and duration of the paroxysms were especially influenced, although the number of seizures was practically unchanged. From 12 to 16 grains in twenty-four hours were given to a child one year of age. When given in syrup of raspberry on a full stomach, or with plenty of water, the bromids occasion very little disturbance. For a child two years of age, 16 to 24 grains may be given daily.

Antipyrin was used later in 60 test cases in the institution, as well as in out-patient and in private work. I have given antipyrin, combined with bromid of soda, in over 600 cases of pertussis. The antipyrin, combined with syrup of raspberry, was given, under the same conditions as those related:

℞ Antipyrinæ ..... gr. xviij
Sodii bromidi ..... gr. xxx
Syr. rubi idæi ..... ℥v
Aquæ ..... q. s. ad ℥ij
M. Sig.—One teaspoonful every two hours—six doses in twenty-four hours (for a child fifteen months of age).

Antipyrin is readily taken and easily borne by the stomach—two very desirable requirements in a drug that is to be given to a child for a considerable time. It is not depressing when given with any degree of intelligence—in fact, it is well borne by children when given in good-sized doses, and it controls whooping-cough better than does any other drug I have ever used. Its beneficial effects are as follows: The paroxysms are diminished in number from one-third to one-half without any amelioration of an individual seizure, or the seizures may be less severe without any diminution in their number. In some cases both the severity and the number of the paroxysms were favorably influenced. In all the cases the effect of the drug was beneficial.

Of all the drugs used alone, antipyrin gave the best results. The bromids took the second place. We then combined the two and used them in 40 institution-cases, and soon learned that the two drugs given together controlled the disease more effectively than either given separately. These observations were made over twenty years ago. Up to the present time, in an observation of several hundred cases, we have found no better drug treatment. The dosage of the two drugs combined is as follows: For a child eight months of age, ½ grain of antipyrin with 2 grains of bromid of soda are given at two-hour intervals—6 doses in twenty-four hours; for a child of fifteen months, 1 grain of antipyrin and 2½ grains of bromid of soda at two-hour intervals—6 doses in twenty-four hours; from the fourth to the eighth year, 3 grains of antipyrin and 5 grains of bromid of soda at two-hour intervals—6 doses in twenty-four hours.

Codein is to be used only in the most severe forms of pertussis, when other means fail to relieve the patient. One of the most troublesome features of the disease—in fact, a dangerous feature—is the wakefulness at night caused by repeated attacks of coughing and vomiting. When the child cannot sleep, I give codein independent of the other treatment, whatever it may be. For a patient five years of age $\frac{1}{6}$ grain is given at bed-time and repeated during the night whenever the paroxysms require. For a child from eight to twelve years of age, $\frac{1}{4}$ grain may be given at bed-time and repeated twice if necessary. For a child from two to three years of age, $\frac{1}{10}$ grain may be given and repeated not oftener than twice during the night. The drug should not be continued longer than a week or ten days. I have never seen unpleasant effects follow its use.

Interrupted Medication.—It will be observed that the drugs of value in whooping-cough are the sedatives. It is well known that by the prolonged use of sedatives their effect is lost. For this reason I have found it wise to use what may be called "interrupted medication." For five days the antipyrin and bromid of soda are given. Full doses of quinin only are then given for five additional days, at the end of which time the antipyrin and bromid are resumed. In this way, giving the drugs five days each, I continue with advantage for a month or six weeks. It is rarely necessary to continue the treatment longer than six weeks—usually from three to four weeks is sufficient. Of course, the child will whoop after that time, but the active stage of vomiting and

severe paroxysms will be over. If the vomiting can be controlled in an attack of pertussis, and if the patient can obtain sufficient sleep, much has been accomplished. I would emphasize here, what has already been suggested: *do not begin the specific whooping-cough treatment*, whether by the administration of quinin, antipyrin, or other remedies, *until the spasmodic stage is at its height.* If a sedative is given as soon as a diagnosis is made, by the time the disease reaches its height tolerance will have become so established that the drug will have lost not a little of its sedative action. If medicines must be given during the earliest stage, a placebo may be used. The infant asylum patients, upon whom the best of our observations were made, received distilled water colored with compound tincture of cardamom.

Steam inhalation is referred to only to call attention to its value when used in connection with the drug treatment. It has been of great service to the very young, and those who have complicating bronchitis and bronchopneumonia. I prefer the Arnold steam atomizer (Fig. 86). The nozle is placed about 8 inches from the face, which alone is exposed, the other parts of the body being well protected by a rubber sheet. The inhalations, when taken from fifteen to twenty minutes every two hours, often give a weakly, cyanosed patient marked relief. I have used wine of ipecac, creasote, and turpentine in the water thus vaporized, as mentioned before; but I am not convinced that they offer any advantage over plain steam.

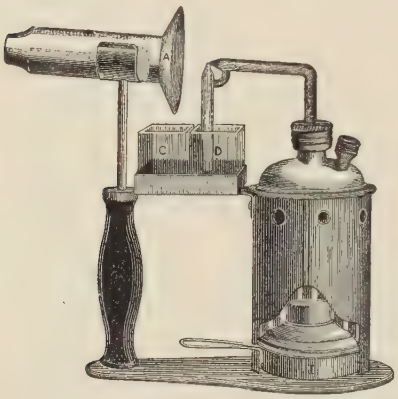


Fig. 86.—The Arnold steam atomizer.

Fresh air is of immense value as a means of relief in whooping-cough. We are told that the child rarely coughs when out-of-doors, but commences as soon as he is brought into the house, which is usually overheated and badly ventilated. In nearly all cases the cough is worse at night. This may be explained in part by the absence of proper ventilation in the sleeping apartment. Many out-patient mothers tell me that keeping the child for hours near a gas tank relieves the whooping-cough. Undoubtedly, there is a vast difference between the comparatively pure air in the vicinity of the gas tank and the air of the average tenement. I always encourage the gas-tank treatment. A child who for any reason must remain indoors should not be allowed to remain constantly in one room. There should be two rooms and every window in the one not in use should be freely open. The living-room and sleeping-room should be kept at a fairly even temperature—from 68° to 70° F.

The Kilmer Belt.—A few years ago Dr. T. W. Kilmer, of New York, conceived the idea that a belt around the child's body producing firm

pressure, would support the abdomen sufficiently during a coughing paroxysm to prevent vomiting. The Kilmer belt (Figs. 87 and 88) was the outcome. I have used the belt in a considerable number of cases, at first with a great deal of skepticism, watching the patients upon whom it was used at my clinics at the out-patient department at the Babies' Hospital and at the New York Polyclinic, where records were kept of the number of vomiting seizures in twenty-four hours, for three days before applying the belt, and also after the belt was in use, noting the statements of the mothers and oftentimes of the children themselves. These records convinced me that the belt has a field of usefulness in the management of whooping-cough. I later adopted it for use by my private patients. Like most remedial measures, however, its use is not always

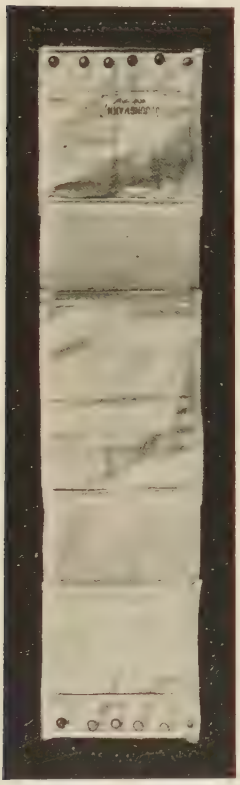


Fig. 87.—The Kilmer belt.

Fig. 88.—The Kilmer belt in position.

attended with success. I have applied the belt without the slightest benefit in some vomiting cases. Usually, however, it is of service in relieving the vomiting. In some instances the vomiting has entirely ceased after the belt was applied. I believe it should be given a trial in every severe case, particularly when the vomiting is a very prominent symptom, and in the case of infants in whom the drug treatment is unsatisfactory. The belt,* which has been improved from time to

*The belt is made by J. Jungmann, New York. The circumference of the abdomen around the most prominent parts should be taken. This measurement, with a statement of the child's age, should be sent to the manufacturer.

time, is made of linen, with pieces of rubber elastic at those portions which rest against the sides of the child. There are eyelets in each end for the purpose of lacing the belt together. It should be applied over the nethermost garment.

Vaccine Treatment.—I have not used the vaccines in a sufficient number of cases to have formed an opinion regarding their value. John Freeman, working with Wright in the St. Mary's Hospital in London, has treated by this method 1140 cases. His method was to use a control injection of normal salt solution in an equal number of other cases. Freeman believes that the patients who received the vaccine did somewhat better than those who were given the salt solution. In a considerable number of cases pneumococcus vaccine was given with the pertussis vaccine. Such cases also did slightly better than those receiving the salt solution. He expresses "doubt as to whether one should strongly advocate this line of treatment." He feels that, on the whole, the inoculations give the children a better chance, and inoculated his own children when they had whooping-cough.

The routine treatment for a child five years of age was 250,000,000 of Bordet's bacillus, and 10,000,000 pneumococci weekly. Very young children received 50,000,000 of Bordet's bacillus and 2,000,000 pneumococci. Freeman has observed no unfavorable after-effects.

MEASLES

By some writers measles is credited with an antiquity as great as that of small-pox, but the fact that measles was long confused with other exanthemata renders it doubtful whether descriptions over two centuries old should be accepted. Measles has always been one of the most rapidly advancing of epidemic diseases. In communities long unaffected, such as Iceland and the Fiji Islands, it has attacked the greatest numbers and developed the highest virulence. In the years 1834 to 1836, and 1842 to 1843, nearly the whole of Europe was invaded.

Buxton, whose elaborate little monograph, published a century and a quarter ago, still affords much of value, says: "Those who die of measles generally receive their death by a great flux of serum to the lungs." Certain it is that bronchopneumonia has always given to measles an importance out of all proportion to its immediate severity.

Transmission.—Measles is the most readily transmitted of all the communicable diseases. A very few seconds' exposure is all that is necessary. Very few of the human race escape. The disease is transmitted by direct infection. Transmission through an intermediary is not of frequent occurrence. I have never known a proved case.

Etiology.—The disease may be transmitted from the beginning of the earliest catarrhal symptoms, which become manifest two or three days before the appearance of the rash. The most infective period is during the first four or five days; how much longer it may continue is unknown.

Goldberger and Anderson have been able to produce measles in

rhesus monkeys by inoculating them with the blood of human cases of the disease. They proved that the blood in measles is infected before the appearance of the rash and during efflorescence of the eruption, while the infectivity decreases twenty-four hours after the eruption has appeared. The buccal and nasal secretions are also infective at the time of the appearance of the eruption and for forty-eight hours afterward. The desquamating scales, on the other hand, were not infective. The nature of the virus has not been proved, but it is filterable through a Berkefeld filter, resists drying for twenty-four hours, and becomes inert after fifteen minutes' exposure to 55° C.

Lucas and Prizner have confirmed the work of Anderson and Goldberger, and showed further that the inoculated monkeys develop Koplik spots just as do human subjects.

Age.—No age is exempt. In scarlet fever and diphtheria, nature surrounds the very young with a certain degree of immunity. The tenderest age is susceptible to measles.

Incubation.—The period of incubation ranges from seven to fourteen days. It is rare for the disease to develop after the tenth day following exposure. I have known a very few cases to develop, however, as late as the fourteenth day.

Symptoms.—In marked contrast to scarlet fever, measles is fairly constant in its manifestations. Very severe cases and very mild cases are encountered. Institutional children have measles much more severely than do private patients, and the former cases are much the more fertile in complications. This is because of the natural disadvantages which an institution necessitates, no matter how well it is conducted. The complications are more frequent because of the more frequent presence of secondary infection to produce the complications.

The Eyes.—The first manifestation of the illness is a coryza with mild conjunctivitis. The eyelids become swollen and reddened at the margins. There is photophobia.

Cough.—A cough is present from the beginning or develops in a short time. The cough is hard, teasing, and, early in the attack, without bronchial secretion. Occasionally the cough will be hoarse and croupy, but this is of rare occurrence.

Temperature.—There is usually slight elevation of the temperature at the onset. If there is an elevation, it is rarely above 101° F. Convulsions occur very rarely, and when present are usually due to indigestion.

The Rash.—The characteristic rash usually makes its appearance about the ears and over the neck and upper portion of the chest. From here it spreads to the entire body, the last portions involved being the feet and hands. In its disappearance, the rash follows the same order. It consists of red papules and macules of irregular shape and of variable size. Early in all cases, and throughout most mild cases, there are areas of uninvolved skin between the erupted areas. In severe cases the areas of eruption coalesce so that the face, trunk, and limbs or the

entire skin surface may present a livid, deeply congested appearance. The face, covered with the diffuse rash, swollen and edematous, the eyes with the swollen lids closed and secreting, and the thin, watery nasal discharge present a picture seen in many cases of measles and never elsewhere.

The rash is sometimes quite irregular in the time of its appearance after the onset of symptoms. I have seen it occur very early, coincident with the onset of the catarrhal symptoms, and I have seen it delayed for a week. The eruption requires from three to six days to complete development.

Pronounced fever does not develop until the appearance of the rash. Both the temperature and the rash reach their greatest intensity at the same time. Rarely there is a prodromal fever for a few hours. This may reach 103° to 104° F. This fever subsides quickly and the indications are that the exposed child will not develop the disease. Within forty-eight hours, however, or less, the temperature again begins to rise with the appearance of the rash. In cases of this nature I have had difficulty at the outset in persuading parents of the necessity of keeping the child in his bed, or even in the house, as the illness is looked upon by the family as a cause of false alarm.

Diagnosis and Differential Diagnosis.—The diagnosis in most cases of measles is not difficult. A mild case may closely simulate one of severe German measles. The presence of Koplik spots (see Plate II) on the buccal mucous membrane, the conjunctivitis, and cough are usually sufficient to mark the case as one of true measles.

There are no other skin manifestations of disease that simulate those of measles sufficiently to occasion confusion.

Complications.—Children with measles almost always have some bronchitis. In fact, a mild degree of bronchitis occurs so regularly that it may be looked upon as a part of the disease.

Bronchopneumonia is the most frequent complication, because the diseased mucous membrane of the respiratory tract becomes a fertile field for infection with the pneumococcus and other pathogenic bacteria. The mortality in institutions for children with measles is always large, because of the complication of bronchopneumonia. In a recent epidemic of measles thus complicated, in a New York institution for children, there was a mortality of 40 per cent.

Otitis.—Acute, simple, and suppurative otitis is a fairly frequent complication. Its presence should be suspected when the temperature is continued and does not subside with the disappearance of the rash. The absence of pain does not mean that the ears are normal. In the majority of my cases of suppurative otitis in young children pain has been absent.

Nephritis is a very rare complication. I have seen but one case.

Adenitis.—Adenitis is a rare complication.

Recurrence or Second Attack.—I have known of one recurrence after a two-year interval in a girl seventeen years of age. I attended her during both attacks, the last of which was very severe, and followed by

PLATE II

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

The Pathognomonic Sign of Measles (Koplik's Spots).

Fig. 1.—The discrete measles spots on the buccal mucous membrane, showing the isolated rose-red spot, with the minute bluish-white center, on the normally colored mucous membrane.

Fig. 2.—Shows the increased eruption of spots on the mucous membrane of the cheeks; patches of pale pink interspersed among rose-red areas, the latter showing numerous pale bluish-white spots.

Fig. 3.—The appearance of the buccal mucous membrane when the measles spots coalesce and give a diffuse redness, with myriads of bluish-white specks. The exanthema is at this time fully developed.

Fig. 4.—Aphthous stomatitis sometimes mistaken for measles spots. Mucous membrane normal in color. Minute *yellow points* are surrounded by a red area. Always discrete.

(The Medical News, June 3, 1899.)

a moderately severe nephritis. The family, most intelligent and reliable people, insisted that the girl had had measles at an earlier age, together with other members of the household.

A brother of the patient was also reported by the mother to have had two attacks of the disease.

Prognosis.—The prognosis is good in the cases in which pneumonia does not enter. I have never known a fatal uncomplicated case of measles.

Treatment.—*General Management.*—The popular conception of the management of measles is that the patient should be warmly wrapped, given hot drinks, and kept in a warm room with little or no ventilation. An attack of measles renders the child temporarily a very susceptible subject for bronchopneumonia. The younger and more delicate the child, the greater the danger. The darkened room, with its closed windows and dust, the extra wrappings, with the resulting failure of heat radiation, the reduced vitality, and the resulting loss of appetite do much to prepare the way for an infection of the respiratory tract, which so often occasions pneumonia and bronchopneumonia. If to a case of this nature whooping-cough be added, we have, with few exceptions, a hopeless condition.

A child ill with measles should be comfortably clad in the usual night-clothes and kept in bed. No extra wraps are required, nor is it desirable to keep the room at a higher temperature than is customary —68° to 70° F. is a suitable room temperature. There are many gradations of light between glaring sunlight and utter darkness. Both are extreme, and one almost as undesirable as the other. It is my custom to advise that a window-shade of dark green be lowered within one foot of the window-sill. The light brown or drab shade should be lowered completely. If the shade is white, or of a very light color, and not supplemented by a curtain of dark material, it will be necessary to exclude the bright light by some other means. If the child is old enough, I allow him to dictate the degree of light. Any intelligent child will know when the light is painful to him.

Feeding.—The patient should be put on a greatly reduced diet. For the bottle-fed, the milk mixture should be diluted at least one-half by adding boiled water, and the same quantity given as in health. The appetite in the early stage of measles is practically absent, so that little or no food is taken. Patients may be given water to drink freely at a temperature not lower than 51° F. For "runabout" children, eighteen months of age and over, the diet as suggested for the sick (see p. 100) should be given.

Bowel Function.—There should be one evacuation of the bowels daily. An enema should be given when this does not otherwise take place. The urine should be examined for albumin every second day.

The Eyes.—During the waking hours the eyes should be generously bathed every hour or two with a 3 per cent. solution of boric acid applied with old linen or cotton, which is afterward destroyed.

The Ears.—Otoscopic examination should be made every second day

until the case is discharged. In the event of a sudden rise in temperature during convalescence, which cannot be explained by the condition of the intestines, lungs, or throat, such an examination should be made by an expert.

Baths.—The temperature of uncomplicated measles is rarely high enough to call for special measures. If it should have a tendency to continue about 104° F. for eight or ten hours and the child be uncomfortable and restless, a tepid sponge-bath of ten to twenty minutes' duration may be given, and repeated at intervals of two or three hours. Whether the fever demands bathing or not, the patient should be sponged twice a day with tepid water at 100° F. After he has been dried, an application of cold-cream, liquid albolene, or olive oil should be made to the entire body. This is to be given for the sole reason that it relieves the itching, induces sleep, reduces the temperature, and thus enables the child to pass through the disease with less discomfort.

Delayed Rash.—Now and then a case is encountered in which the rash is slow in appearing. The temperature is high,—104° to 105° F.,—the skin hot and dry, and the child very uncomfortable, perhaps delirious. For such patients a hot bath,—105° F. to 110° F.,—of from three to five minutes' duration, often brings out the rash and greatly relieves the symptoms, which may have been of an urgent character. In removing these children from the bath care must be exercised to keep them wrapped for fifteen to twenty minutes in a blanket which has previously been warmed.

The Cough.—The cough of measles during the active period of the attack is one of the annoying features of the disease, and one for which some relief must be attempted, particularly if the child is kept awake at night. The ordinary expectorants alone are of no service in treating the cough of measles. Only a sedative will give relief. To a child six months of age from 5 to 8 drops of paregoric may be given, and repeated if necessary after an interval of two hours. The following combination of paregoric and sweet spirits of niter is often of service:

℞ Tincturæ opii camphoratæ.....gtt. x
Spiritus ætheris nitrosi.....gtt. iij
M. Sig.—One dose; to be repeated every two or three hours (for a child of eighteen months or older).

From the first to the second year, 10 to 15 drops of paregoric or ½ grain of Dover's powder may be given at two-hour intervals, if required. Usually but two or three doses of the sedative will be necessary during the night. Should the paregoric or Dover's powder be objectionable because one may dislike to give opium to young children, from 3 to 4 grains of sodium bromid in 2 drams of water, repeated as required every hour or two, will be of service for a child under two years of age. From the second to the fifth year 1 grain of Dover's powder, or from 15 to 25 drops of paregoric, or $\frac{1}{10}$ to $\frac{1}{6}$ grain of codein, may be given at intervals of from two to four hours.

If bronchitis develops sufficiently to require treatment, as it does in at least one-half the cases, the means for the management of bron-

chitis suggested on p. 306 will be found useful. The temperature of a child ill with measles should be taken three times daily, and the lungs and heart should be examined every day.

Vapor.—It is my custom to keep the air of the sick-room moistened with vapor during the entire illness. Its benefits are twofold: It relieves the cough, as it is more agreeable than dry air to the congested mucous surface during the early stage; and it prevents the free circulation of dust, the danger of which has already been referred to. If the room is carpeted, it should be well sprinkled with water before sweeping. If, fortunately, the floor is bare, the broom can be dispensed with and a damp cloth used instead.

Fresh Air.—Not only should air of the sick-room be vapor-charged, but it should be frequently changed through proper ventilation.

Quarantine.—The length of quarantine is usually from twelve to sixteen days, at least ten days of which time are spent in bed.

GERMAN MEASLES (RÖTHELN; RUBELLA)

German measles is a disease of the runabout and school-child. It rarely occurs in infants. It is one of the mildest diseases of the transmissible class.

Etiology.—The specific etiologic agent of German measles is quite unknown, but that it is not identical with that of either measles or scarlet fever is evidenced by the fact that an attack of rubella does not protect against either of these diseases.

Transmission is by direct contact. I have never had proof of the transfer through an intermediary. I have never known of a second attack.

Incubation.—The period of incubation is from two to three weeks.

Symptoms.—The first symptom is usually the rash. The temperature rarely goes above 101° F. In a very few cases I have known the temperature to rise to 102° F., and the rise has occurred at the onset of the illness. The catarrhal symptoms are negligible. There is rarely more than a slight infection of the conjunctiva.

The *rash* is not only the first manifestation of the disease, but it remains the principal evidence of the infection. The eruption closely resembles that of measles, and differentiation between the two diseases from the standpoint of the rash may be difficult. It usually appears first about the ears and neck and spreads rapidly. The eruption at first is distinctly smaller than that of measles; it is papular and varies from a faint red to a deep red color; rarely it is distinctly punctate. When this is the case, the erupted areas may coalesce, producing a diffuse blush not unlike that of scarlet fever. The eruption is usually very temporary, lasting from one to three days. It disappears after the order of its appearance, leaving the face and the neck first. There is no resulting pigmentation or discoloration of the skin, such as may occur in true measles.

There is no involvement of the buccal surfaces.

Lymphatic Gland Enlargement.—Enlargement of the gland at the

angle of the jaw and the post-cervical glands, particularly the latter, occurs so consistently that this condition may be put down as one of the prominent symptoms of the disease. The glandular involvement, however, is very slight, and disappears in from two to four days. The glands in the axilla and groin very rarely show involvement.

Desquamation.—Only the severer cases are followed by a slightly branny desquamation.

Diagnosis and Differential Diagnosis.—The disease may be confused with measles, scarlet fever, and the indigestion and drug erythemata. The mildness of the symptoms is a strong point in favor of German measles. Exceptionally, a severe case may be difficult to differentiate from true measles. In such an instance the absence of eruption on the buccal mucous membrane (Koplik spots) is a valuable aid. Further, the lymph-gland enlargement does not occur in measles.

Scarlet Fever.—The characteristic angina, which is a fairly constant symptom in scarlet fever, is never present in measles. There is no post-cervical gland enlargement early in scarlet fever; and while the rash of German measles may resemble that of scarlet fever, the former exanthem is coarser in appearance, the punctate dots are larger, and the rash presents a blotched appearance, in contradistinction to the general diffuse intense blush of scarlet fever. In scarlet fever, furthermore, the desquamation is characteristic. In erythema due to drugs there is no manifestation of illness of any nature. A rash due to indigestion is very transient and is apt to be urticarial in type.

Complications.—I have never known a complication to develop with this disease.

Prognosis.—I have never known a fatal case.

Treatment.—Rest in bed for about two days, confinement to the house for a slightly longer period, reduced diet, and the promotion of free bowel action are usually all that are needed. Recovery is ordinarily complete in six to eight days from the beginning of the attack.

Isolation is not a necessity unless there are very young or delicate children in the family.

DIPHTHERIA

Diphtheria has been known by its present name for less than a century, although the terms "ulcus Syracum" and "ulcus Egyptacum," together with references to certain anginas with very peculiar expectoration, indicate that the disease was prevalent as far back as the time of Hippocrates. As early as 100 B. C. Asclepiades, of Bithynia, quoted by Galen and Aretæus, is said to have known diphtheria and practised laryngotomy. Aretæus gave the first important description of "angina gangrenosa," and Galen, in the second century, described the membranous expectoration.

Not, however, until the early part of the eighteenth century did study of the disease become productive. In 1719 Wolfgang Wedel, of Jena, issued a document on the value of isolation. A little later an epidemic near Boston, and in 1745 another in Paris, resulted in the

description of cutaneous diphtheria and of paralysis of the palate and eye muscles. Home accurately described the membranes in 1765 and invented the term "croup," to differentiate the condition under discussion from the "angina maligna" or "gangrenosa" of ancient writers. Not until the publication in 1826 of Bretonneau's famous treatise on the epidemics at Tours was the pathology of the disease accurately defined. Bretonneau combined all the inflammations previously called angina gangrenosa, ulcers, and croup under the term, diphtheria (Διφθήρα, a membrane) and asserted his belief that direct inoculation and contact were the only modes of transmission.

The later history of diphtheria contains its two most important epochs: the discovery by Klebs of the bacillus, in 1883, with its isolation and cultivation by Löffler in 1884; and the introduction of antitoxin into general use as a result of long experimentation (by Behring, Roux, Martin, Chaillon, and Yersin) with the serum of actively immunized animals. Since the report of Roux in 1894 that in certain hospitals antitoxin had reduced the mortality from 58 per cent. to 20 per cent., the wider and more intelligent use of this specific has revolutionized the disease.

Age of Patients.—Diphtheria is of rare occurrence before the first year, although no age is exempt. My youngest patient was five months of age. A case in the practice of a colleague occurred at the sixth week. The most susceptible age is between the second and the tenth year.

Predisposition.—Vigor of constitution appears to exert no influence on susceptibility to the disease. The strong and the delicate are alike subject to the infection.

Diseased Throats.—The presence of diseased tonsils and adenoids appears to be a decided predisposing factor. Throats so involved possess a poor resistance to the infection. It is my observation that a normal throat is the best prophylactic agent, which means that children whose diseased tonsils and adenoids have been removed have the best chance to escape after an exposure.

Transmission.—Diphtheria is contagious and infectious; transmissible through contact—contagious; and through an intermediary—infectious. Transmission from the diseased to the well is usually through personal association. That the disease may be transmitted through an intermediary person, book, or article of clothing, is not to be questioned. Nevertheless, I am confident that sources of exposure are much less frequent than is generally accepted. The sources of many obscure infections are the mild ambulatory cases. Diphtheria may be so mild in an individual that its presence is not suspected, and to such cases is due in many instances the spread of the disease.

Bacteriology.—The morphology of the Klebs-Löffler bacillus varies greatly, but it has a characteristic irregularity of staining and regularity of grouping which are aids to diagnosis. Its demonstration in smears or cultures from the site of the lesion is a necessity for the diagnosis of diphtheria. With the weakly alkaline methylene-blue stain recommended by Löffler the bacilli appear striped, unevenly beaded, granular,

or clubbed; they are arranged in groups of four or six elements, lying parallel or at sharp angles.

The most frequent localization of Bacillus diphtheriæ in the human body is on the mucosa of the throat, larynx, and nose. It may travel down into the lung, causing bronchopneumonia, or into the stomach, causing pseudomembranous gastritis. The bacilli have been found in pus from the middle ear, and the pseudomembranous lesions on the skin and vulva. As a rule, Bacillus diphtheriæ remains localized at the site of the lesion it has produced, and only in very rare instances does it invade the blood—probably as a terminal condition. The toxin formed by the bacillus is responsible for the general symptoms.

The bacillus may persist in the throat for weeks after an attack of diphtheria, however mild such an attack may have been. These bacillus carriers become a menace to other persons, since a mild attack of diphtheria in one individual may yet produce a severe case in another person.

Pathology.—Following an invasion of the mucous membrane by the specific bacillus, a pseudomembrane is thrown out which is firmly adherent to the underlying mucous membrane. The false membrane may be thin and grayish in color, or thick and yellow.

It is the result of exudation into the mucosa, ulceration, and necrosis. The mass thus formed is composed chiefly of fibrin, in the meshes of which are entangled polynuclear leukocytes, desquamated epithelium, and bacteria. The fibrin may be deposited in fairly definite layers. Ulceration and small hemorrhages occur in the subjacent tissue, which is very edematous, and detachment of the membrane may leave a raw, bleeding surface. When the separation occurs naturally, the loosening process is one of autolysis, and large defects in the tissue are healed by granulation. New epithelium is generally flat, and cicatricial contractures are common. The Klebs-Löffler bacilli present in the exudate during the acute stage are usually associated with other organisms, such as streptococci and staphylococci, which determine to some degree the appearance of the membrane.

Any of the mucous surfaces may be involved. Under my own observation the process has involved the nasal cavities, the lips, the mouth, the conjunctiva, tonsils, pharynx, trachea, and bronchi, and in one case the esophagus. The involvement of the trachea, bronchi, and esophagus was proved at autopsy. The rectum and vagina have been the seat of the disease.

Incubation.—The period of incubation is variable. It may be but a day or two, or it may be several weeks. According to estimate, 1 per cent. of school-children carry the bacilli in their throats in a viable form, and yet by no means 1 per cent. of the children develop the disease.

Symptoms.—One of the most important features of diphtheria, in the great majority of cases, is the slow and gradual onset. At first the child may complain of being tired or sleepy and of loss of appetite. Symptoms referable to the throat may appear, but pain is not necessarily present. The breath becomes offensive. The physician is sent for

on the first, second, third, or some later day, depending upon the intelligence of the parents or nurse or upon their confidence in themselves to care for what, at the time, appears to be a simple condition. The child, not willing to go to bed, is looked upon by the uneducated eye as being not at all sick. By the time the case is seen by a physician much valuable time may have been lost. The earlier antitoxin is used, the more certain the recovery. A delay of forty-eight or even twenty-four hours may mean a fatal issue. Not every case has so gradual an onset.

Illustrative Cases.—In the pre-antitoxin period, late in the eighties, an asylum patient died eighteen hours after the appearance of the first symptom.

In March, 1910, a father came to my office leading by the hand two children, aged three and six years. Both had been ill about three days with fever and some difficulty in swallowing. They were supposed to have tonsillitis. The children had not seemed at all ill to the father. A glance showed that they were ill. On further examination both throats were found filled with membrane. They were at once sent to the Willard Parker Hospital and given large doses of antitoxin. One child died in twelve hours and the other in twenty-eight hours.

Localization of the Membrane.—The usual site of the membrane is on the tonsils and the pillars. The pharynx is more rarely involved, and when involved, has usually become affected through extension of the primary lesion.

Temperature.—The temperature, unfortunately, is rarely high early in the case. It seldom rises above 102° F. The low temperature and gradual onset are accountable for many deaths, the physician being called late in the disease. Swelling of the lymphatic glands at the angle of the jaw is an early symptom in about 30 per cent. of the cases.

Diagnosis.—Visible membrane should always be looked upon as diphtheric, and treated accordingly with antitoxin. I have looked into thousands of throats, and feel sure that the man is yet to be born who can say, after inspection alone, that a given membrane is not due to the Klebs-Löffler bacillus. There is *no invariable manifestation, no reliable characterization*, of pseudomembrane due to the Klebs-Löffler bacillus.

Antitoxin should be given in any suspected case, and then a culture should be taken. Following out this practice, I have given antitoxin to children who did not have diphtheria, as proved by repeated cultures. Never have I regretted this practice.

Differential Diagnosis.—Both the streptococcus and staphylococcus will produce a membrane identical with those produced by the Klebs-Löffler bacillus, and the disease may be differentiated only through cultural examination.

Tonsillitis.—In tonsillitis the temperature is high—103° to 105° F. The child is usually much prostrated, and appears very ill. The physician accordingly is called much earlier to the patient ill with tonsillitis than to the one ill with diphtheria.

In tonsillitis the tonsils are more apt to be swollen and enlarged, the exudation appearing in the form of white dots which stud the surface. Care must be exercised, however, in cases which appear to be those of frank tonsillitis. The points of exudation may coalesce and in a day or

two may produce a distinct membrane firmly organized. It is my custom to make a culture in every case showing visible exudation, whether this is on the tonsils or elsewhere.

Illustrative Case.—A mother developed fever and sore throat. The left tonsil was clear. On the right tonsil there were three or four yellowish-white points of exudation. The condition was pronounced tonsillitis by the physician in attendance, and she was not visited further. In four days the doctor was again sent for, and found she had diphtheria with extensive membrane on both tonsils. The mother passed through a desperate illness and recovered completely in six months. In addition to a myocarditis she developed diphtheric paralysis of both lower extremities. Two of her three boys who were my own patients developed the disease and recovered without inconvenience because of the early and free use of antitoxin.

I could recite many other instances of the atypical onset of diphtheria. I have learned never to look lightly upon a throat showing exudation on its mucous membrane.

Prognosis.—A favorable prognosis in a given case depends largely upon two factors: An early diagnosis and a knowledge of the use of antitoxin. The natural resistance of the patient is an important feature, and particularly important is the condition of the throat, whether normal and resistant, or filled with diseased tissue, supplying a favorable culture field for the invading bacilli.

Complications.—The complications, in their order of frequency, are bronchopneumonia, nephritis, endocarditis, otitis, adenitis, and diphtheric paralysis.

Treatment.—Owing to our knowledge of the etiology of diphtheria, and as a result of the advent of the specific remedy, *antitoxin*, the disease has lost much of its former terror. Diphtheria is still, however, an important contributor to the death-rate of all large cities. This is due, first, to parents who fail to appreciate the possible dangers that may arise from a sore throat and who neglect to call a physician early in the illness, and, secondly, to physicians who do not believe in diphtheria antitoxin, who timidly use it in small doses late in the disease, or who wait for positive clinical signs or a report of a culture before using the remedy. Equally as necessary as the realization of the value of antitoxin is the knowledge of how and when to use it and when to repeat its use. In many cases, at the beginning of the disease, when the tonsils alone are involved, it is impossible, without the aid of the laboratory, to differentiate diphtheria from tonsillitis. I have seen case after case in the pre-antitoxin period, in which two or three days were required to make a positive clinical diagnosis. In towns in which a bacteriologic examination is possible it is in some instances safe to wait for a report from such an examination. When one is in doubt, a safer rule to follow in those cases in which there is pseudomembrane on the tonsils is to give antitoxin at once. If the case proves to be one of simple tonsillitis, no harm will follow. I have repeatedly given full doses of antitoxin to patients in whom we afterward learned there was no diphtheria, without any unfavorable results.

Illustrative Case.—During the winter of 1906–07 I was called to see a little girl six years old with a gray, membranous patch on the left tonsil, of the size of the thumb-

nail. There was a temperature of 101° F. The child complained of feeling tired, seemed generally wretched, and had considerable difficulty in swallowing. I immediately gave 3000 units of antitoxin and sent to a private laboratory a culture from the throat. Next morning the report reached me that the Klebs-Löffler bacillus was absent. On visiting the patient at this time I found that the membrane had extended and now covered the right tonsil. I repeated the antitoxin, giving 3000 units, and took another culture. This was sent to another private laboratory. Again the report was negative for the Klebs-Löffler bacillus, but the culture showed a pure growth of the streptococcus. The following morning the throat began to clear, and in two days was normal. Clinically this case was one of diphtheria. There was no scarlatina, but there was some swelling of the glands at the angle of the jaw. Aside from the improvement, the child showed no symptoms whatever to indicate that antitoxin had been given.

Necessity for Promptness in the Use of Antitoxin.—When there is diphtheria and we wait for positive clinical signs or for the report of a culture, if only for ten or twelve hours, we lose most valuable time, and it is this delay that is responsible for many deaths. If there is one thing, in addition to its great usefulness, that we have learned by the administration of antitoxin, it is the necessity of giving the agent at the earliest possible moment in the disease and of giving it in full doses. *When in doubt, give antitoxin.* The age of the child determines in no way the amount to be given at one time.

Choice of Antitoxin.—I have used successfully the antitoxin prepared by Parke, Davis & Co., by H. K. Mulford & Co., and by the Health Department, New York City.

Dosage.—After a large experience in the use of antitoxin I am convinced that it is often given in too small initial doses, even by many familiar with its use. Five thousand units should be given at the first injection. When there is membrane on the uvula, the pillars of the fauces, the posterior pharyngeal wall, or in the nose, we should never await the report of a culture, but give a full dose of antitoxin at once. This should be repeated eight to twelve hours later if there is an extension of the membrane or if there is no change in its appearance. If the throat shows a tendency toward improvement, if there is a curling up and loosening of the edges of the membrane, or if it has taken on the granular appearance peculiar to diphtheric membrane after a full dose of antitoxin, we may safely wait twelve hours longer—twenty-four hours in all—before deciding whether a repetition of the original dose or the administration of a smaller one is required. In the nasal cases, a diminution in discharge, a lessening of the breath fetor, a reduction in the glandular swelling, and a fall in the temperature—all are indications of improvement, but the physician should not rest unless the constitutional improvement and the clearing-up process are rapid and complete. When the case shows no sign of improvement, more antitoxin should be given.

A child ill with diphtheria must be looked upon as poisoned. Antitoxin is the antidote, and every case must receive enough of the antidote to neutralize the poison. Whether enough antidote will be supplied depends upon the duration of the infection when seen by the physician, and upon his ability to apply the remedy. In a recent severe case, in a girl eight years of age, 16,000 units, given in 3 doses on successive days,

were required before the disease yielded. The first injection was given on the second day of the disease. In a laryngeal case in a boy five years of age 9000 units were given in nine hours. I have not found it necessary to give more than 30,000 units to one patient.

Means of Injection.—There are several antitoxin syringes on the market, any one of which may be used if it will admit of repeated boiling, for in every instance the syringe should be boiled before using. The "Record"* antitoxin syringe (Fig. 89) satisfactorily fulfils these requirements. Some of the private producers of antitoxin furnish it in a glass bulb with an appliance for subcutaneous injection. The advantages possessed by this combination are its convenience and its safety, for as the instrument has to be used but once, the danger of infection by means of a syringe which is used repeatedly is thus avoided.

Site of Injection.—The skin over the abdomen between the umbilicus and the anterior spine of the ilium is doubtless the most convenient site for the injection. The skin is very loosely attached at this point and the serum passes freely under it, requiring very little force and producing no laceration of the tissues or soreness of the parts sufficient to interfere with the child's customary position in bed. If the buttocks, favorite sites for the injection, are selected, the needle should be in-

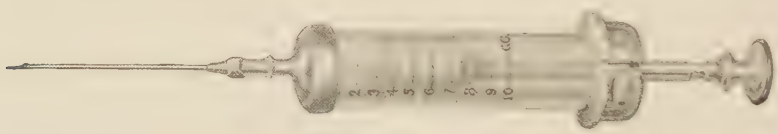


Fig. 89.—"Record" antitoxin syringe.

serted well upon one side, so as not to interfere with the resting posture of the child.

Before injecting, the skin should be thoroughly scrubbed with green soap and washed with alcohol. Upon the withdrawal of the needle the skin should again be washed with alcohol, and a piece of zinc oxid plaster, one inch square, applied over the site of the injection. Under these precautions regarding cleanliness there has never been, in my experience, a suggestion of a local infection. Wherever the site of the injection, care should be taken not to plunge the needle into the muscle, but having drawn up the skin between the fingers, to insert the needle horizontally.

Late Injection.—Antitoxin should always be given in diphtheria, no matter how late in the disease the case may first be seen. In one case first seen by me on the sixth day, 11,000 units were given in three injections at eight-hour intervals. The child recovered. In another case of laryngeal diphtheria in a boy five years of age who was first seen on the fifth day 11,000 units were given in nine hours, with prompt recovery. I have used the antitoxin as late as the eighth day of the

*The "Record" antitoxin syringe may be obtained from James C. Dougherty, 409 West Fifty-ninth Street, New York.

disease, with resulting benefit or recovery, and it is my belief that the patient would not have recovered without antitoxin. In order to be signally effective, the serum should be given not later than the third day. The later it is given, the greater the amount required, and the greater the need of repeating the injection. Considerable discredit has been cast upon antitoxin by those unfamiliar with its use. We frequently hear of death from diphtheria after the administration of antitoxin, the patient having received but 2000 or 3000 units, and that amount perhaps late in the disease. It would be as irrational to claim that quinin is of no value in malaria because 3 or 4 grains daily make no impression on the disease, as it is to claim that antitoxin is of no value in diphtheria, because 2000 or 3000 units are given without beneficial results, even when administered early in the disease.

Immunization and Quarantine.—When a member of a family becomes ill with diphtheria, the suggestions for quarantine (p. 629) should be carefully followed. In every case of diphtheria other children of the family should be immunized. Less than 1000 units should never be given for this purpose, regardless of the age of the child. Cultures should be taken from the throats of children and adults alike. If the Klebs-Löffler bacillus is found, the carrier must be isolated and treated as diphtheric, so far as quarantine is concerned. Two of my cases developed diphtheria after immunizing doses of antitoxin. A child nine months of age was given 3000 units and developed diphtheria four days afterward. This patient recovered after a second injection of 3000 units. A boy four years of age was given 1000 units for immunization. He developed diphtheria in thirty-six hours, which was controlled by the injection of 3000 units. The throat was clear in forty-eight hours after the second injection.

Urticaria.—In 20 per cent. of my cases urticaria followed the use of antitoxin. The most severe urticaria occurring under my observation followed an injection of 3000 units. The earliest appearance of the eruption was on the fifth day following the injection; its latest appearance, on the twenty-first day. The urticaria apparently differs in no respect from that due to other causes, and the treatment should be the same. Among local applications, a 1 per cent. solution of carbolic acid or a lead and opium wash relieves the itching better than do other measures. For internal administration, salicylate of soda answers better than any other form of medication. To a child five years old three grains well diluted may be given every two hours until five doses have been taken, and this treatment may be repeated every day until the rash disappears.

Remedial Measures Other Than Antitoxin.—Of the many remedies which have been advocated and used from time to time in the treatment of diphtheria, practically none remains in use at the present time. During the pre-antitoxin period I had abundant opportunity, in 103 cases at the New York Infant Asylum, to test the value of drugs, inhalations, vaporizing treatment, local applications, gargles, and sprays. In an article relating to this epidemic of diphtheria which I wrote

several years ago is the following statement: "The death-rate in the institution from diphtheria was large—about 60 per cent. mortality. In so far as the methods of treatment were concerned, all were equally valueless. The mild and some moderately severe cases recovered under good general management. The severe cases died regardless of treatment." In other words, there was no method or scheme of treatment used at that time that was of any signal value. Happily, at the present time, all the old methods are forgotten. They are not needed. Antitoxin is a specific. The use of sprays and gargles and applications is of value as a means of cleanliness only. For this purpose the throat irrigation (p. 277) answers better than any other means. Forcible irrigation of the nose should not be employed. In such cases the danger of forcing infected material into the Eustachian tube, with resulting secondary otitis, is real. In small children, if the breathing is interfered with because of membrane or tenacious secretions in the nose, a few drops of liquid albolene instilled every hour will give as much relief as can be furnished by any other local measure.

Sick-room Régime.—In the management of diphtheria the same sick-room régime should be enforced as in other serious diseases. The temperature of the room should never be above 70° F., and at all seasons of the year there should always be a free communication with the outer air by means of an open window. The child should wear the customary night-clothes, and the bed-clothes should be of the same weight as those used in health.

Nourishment.—The nutrition of the patient is most important. As a rule, food is poorly taken because of the pain caused by swallowing. Inasmuch as but a few ounces may be taken at one time, the nourishment may well be given in as concentrated a form as possible. Milk should be given as the chief article of diet, with the addition of lime-water or bicarbonate of soda. If the taste of milk is disagreeable to the patient, it may be mixed with equal parts of a thick gruel and well salted. Animal broths possess so little nutriment that their use is unwise. The milk, plain or diluted, will often best be taken if given cold or cool, even to children under one year of age. Fluid will usually also be taken from a spoon or cup better than from a bottle, because of the discomfort produced by drawing on the nipple. When sufficient nourishment will not be swallowed, gavage (p. 758) or rectal alimentation assists temporarily in maintaining nutrition. The temperature is rarely high enough to require the use of any means for its reduction. In case of high fever the sponge-bath or cool pack (p. 749) will answer the requirements.

Heart Stimulants.—When the heart action becomes weak, irregular, or intermittent, stimulation will be necessary. For this purpose three drugs are of signal value—strychnin, tincture of strophanthus, and alcohol.

Laryngeal Diphtheria.—Laryngeal diphtheria may develop coincidentally with a tonsillar or faucial diphtheria. The laryngeal inflammation may develop secondarily after a day or two of illness, or it may be

the first manifestation of the infection. When a child ill with faucial or tonsillar diphtheria develops a hoarse or croupy voice, with or without impeded respiration, almost invariably the larynx has become involved.

Differential Diagnosis.—When, in the event of a hoarse, croupy voice with obstruction as the manifestation of illness, no membrane is visible, it is by no means easy to determine whether the case is one of membranous laryngitis or acute catarrhal laryngitis. The following suggestions have aided me not a little in arriving at a right conclusion:

Diphtheric Membranous Croup	Catarrhal Croup
Gradual onset.	Obstruction intermittent
Obstruction persistent, with gradually increasing severity.	Sudden onset.
Obstruction both to inspiration and expiration.	Obstruction to inspiration, but little to expiration.
Little or no response to emetics or inhalations.	Response to emetics and inhalations and
No response to sedatives.	to sedatives.

The mode of onset is, of course, not to be relied upon absolutely in differentiation. Occasionally the onset of catarrhal laryngitis may be gradual, while that of diphtheria may be sudden. In the consideration of a great many cases, however, the points of differentiation are of sufficient value to warrant the attention which has been given them. A particularly valuable sign of diphtheric involvement is the obstruction to expiration as well as inspiration. In catarrhal croup there is obstruction to inspiration only.

Treatment.—A safe rule to follow, in view of the urgent demand for early injections of antitoxin, is the same as in other forms of diphtheria, *i. e.*, when in doubt, inject from 7000 to 10,000 units. From the gradual cessation of the laryngeal symptoms it is fairly safe to assume that the child is doing well, although the breathing may not be entirely free for forty-eight or seventy-two hours after the first injection. In cases which require intubation 10,000 units should be given for the first injection and repeated the following day. According to my observation, intubation cases require from 10,000 to 30,000 units, even when antitoxin is used early, by which we understand on the second or third day of the disease. If this amount or more must ultimately be given, it should be given early in the disease. The earlier the injection, the less frequent will be the necessity for its repetition.

Nasal Diphtheria.—There are two distinct types of nasal diphtheria —the acute and the chronic.

The acute cases resemble in all respects those of diphtheria as it occurs in the throat or larynx with the accompanying clinical manifestations of illness and prostration. There may be membrane elsewhere, and in many of the cases involving the throat and larynx the nares are also involved. At autopsies, before the advent of antitoxin, I have repeatedly seen the nasal passages plugged throughout their entire extent, the membrane being continuous from the anterior nares to beyond the first bronchial bifurcation.

In what may be looked upon as the strictly nasal cases, the mucous membrane of one or both nasal passages only is involved.

Symptomatology.—A symptom pointing strongly to a Klebs-Löffler infection of the mucous membrane of the nasal passages is a persistent excoriating mucous discharge, with or without a tinge of blood. The fever, prostration, and other evidence of the infection may be as severe as when the membrane is elsewhere located.

Diagnosis.—The diagnosis is made by the appearance of the persistent excoriating discharge, by the discovery of false membrane in the nasal cavities, and by the finding of the Klebs-Löffler bacillus in the nasal discharge.

Treatment.—The treatment is with antitoxin, as suggested for the tonsillar and faucial cases.

Persistent Nasal Infection with the Klebs-Löffler Bacillus.—Persistent nasal infection of a mild type is of much more frequent occurrence than is generally known. These cases are sometimes alluded to by writers under the term "chronic nasal diphtheria."

Symptoms.—The child has a persistent nasal discharge from one or both nostrils, but shows no sign of illness other than that occasioned by the persistent rhinitis. Since there are no systemic effects, these are not cases of diphtheria in the accepted sense of the term. Ulcerations are occasionally produced, and there may be destruction of membrane, cartilage, and bone.

Illustrative Cases.—Case 1.—A girl of eight years of age was brought to my office because of a nasal discharge associated with considerable obstruction. The child had been ill for about one week, and had been treated for grip by home means. There had been slight fever and little or no prostration, but a serous nasal discharge which was bloody at times. There had been one or two severe nasal hemorrhages. An examination of the nasal cavities disclosed that both were filled with membrane, pus, and blood. Nasal diphtheria was at once suspected, and a culture was made which was negative. During the following three days six cultures in all were made and examined by three different bacteriologists in three laboratories, and all reports were negative for the Klebs-Löffler bacillus. The membrane was removed on two occasions, and there were three fairly severe nasal hemorrhages while we were trying to determine the nature of the infection. Various local measures were employed without in any way influencing the process. After observing the case one week, during which time the child remained free from constitutional disturbance of any nature, I gave 5000 units of antitoxin. In twenty-four hours the nose was clear and only a considerable erosion on the septum remained, which promised to give trouble because of its depth and tendency to bleed. This area was cauterized and healed promptly, and the child was then well.

Interesting is this case in view of the cultural absence of the Klebs-Löffler bacillus, and the prompt response to antitoxin, which proved beyond doubt that the case was one of diphtheria.

Case 2.—A strong, robust boy, twelve years old, from a New York suburb, consulted me solely on account of inability to breathe through his nose and a night cough which was quite severe. Examination of the nose showed it to be filled with crusts, pus, and dried blood. Upon removing the obstruction a bleeding surface was left on both sides, and a perforation of the septum, the size of a dime, was found posteriorly. A culture was taken and showed a pure growth of the Klebs-Löffler bacillus. Five thousand units of antitoxin were given. The condition immediately improved. Within four days the nose was free from the Klebs-Löffler bacillus. This condition had existed for at least a year, and the boy had been examined by a specialist.

Case 3.—A girl four years of age became ill with fever, which persisted for thirty-six hours, when the attending physician noticed a swelling and edematous condition

of the soft palate. On seeing the case forty-eight hours after the onset I found the swelling and edema still present, with considerable post-nasal discharge. At no time was membrane visible. A culture was taken which proved negative. Five thousand units of antitoxin were given, and the child made a prompt recovery in about forty-eight hours. While there is no direct proof that the child had diphtheria, the prompt recovery after antitoxin suggests this condition. The absence of cultural proof, in view of our experience in the first case recounted, does not signify that the infection did not exist.

Much remains to be learned regarding the Klebs-Löffler bacillus and its action upon the individual. The effects of this organism may be entirely local. Every year in hospital work we see many of these cases. In private they are less frequently encountered. On the other hand, what is apparently the same organism, with the same morphologic characteristics, may produce not only local effects but the most profound systemic toxemia and death.

In the cases with local manifestations, are we dealing with the Klebs-Löffler bacillus in an attenuated form, or is the infection of a different nature and due to another organism of the same family? Is it possible for the cases showing only local manifestations to transmit the disease

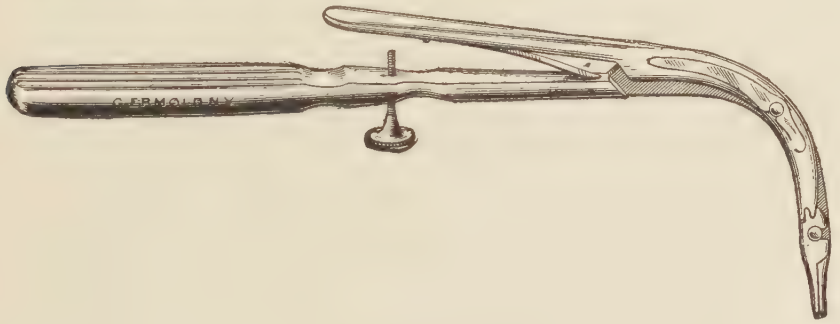


Fig. 90.—Extubator.

to others with resulting systemic effects? I have never known of such an occurrence.

Treatment.—In these cases usually one dose of 5000 units of antitoxin is sufficient. In case the process is not controlled, this dose should be repeated.

Intubation.—To the genius of the late Dr. Joseph O'Dwyer, of New York, is due the perfecting of this operation, which will forever stand as a monument to the inestimable service which he rendered to mankind. The O'Dwyer intubation set (Fig. 92) furnishes us with the necessary instruments for the operation. Various modifications of the tubes, the introductor, and the retractor have been attempted from time to time by others, but the original perfected design of O'Dwyer has yet to be improved upon.

Intubation of the larynx may be required in case of a retropharyngeal abscess situated low on the posterior pharyngeal wall, edema of the larynx, or acute laryngitis. The greatest usefulness of the operation,

however,—that for which it was designed,—is to relieve the stenosis of laryngeal diphtheria. Before attempting to introduce a tube into the larynx of the living subject the physician should familiarize himself with the operation on the cadaver. In no other way can the procedure

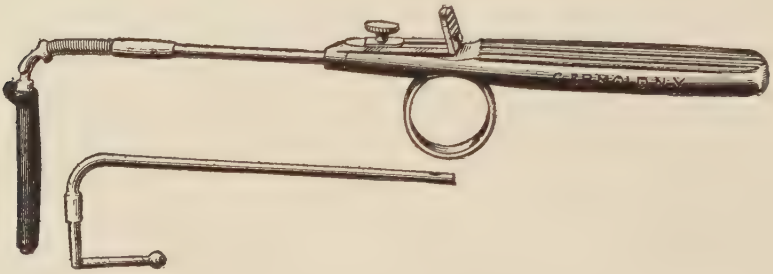


Fig. 91.—Introductor with tube attached.

safely be learned. Attempts at intubation by the unskilled on the living subject can result only in laceration and other gross injuries to the parts.

Indications.—When to intubate is a question puzzling alike to stu-

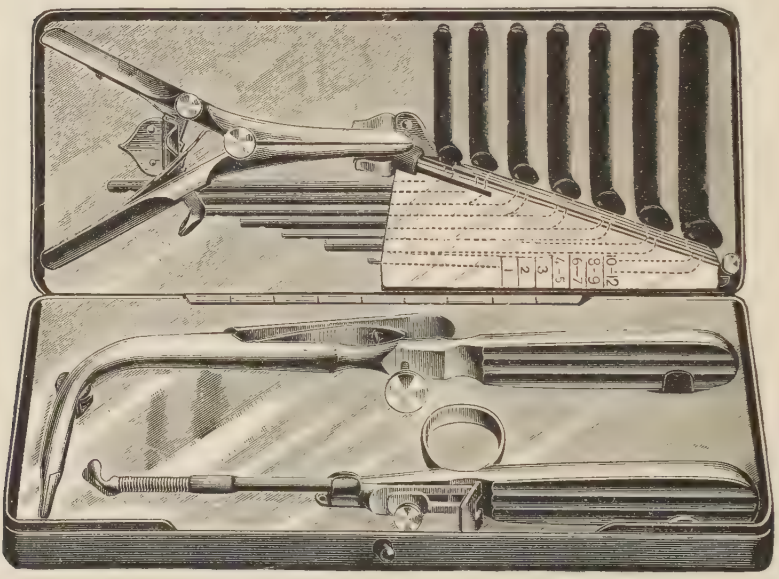


Fig. 92.—O'Dwyer intubation set.

dents and to many physicians. It has been variously answered, and many attempts have been made to formulate a series of clinical manifestations the presence of which would render the operation necessary. Thus, it has been said to be indicated when there is a pronounced reces-

sion of the suprasternal and infrasternal regions, and when, as a result of stenosis, air enters the bases of the lungs but feebly or not at all. It may safely be said that intubation is never done too early, but it is very apt to be done too late—not too late in a great majority of instances to be of some service to the patient, but too late to be of the greatest possible service. My rule regarding intubation in laryngeal diphtheria is to intubate when I see that the child is wasting vitality in his efforts to carry on respiration. Intubation should not be postponed until he becomes exhausted in the struggle for air. Diphtheria is a disease in

Fig. 93.—Position for intubation.

which every possible strength-unit must be preserved. Energy wasted in supplying air is an unnecessary waste, since O'Dwyer has shown us how to introduce a tube into the larynx.

Operation.—For the operation of intubation, the patient should be wrapped from his shoulders to his feet in a sheet securely pinned from top to bottom. The older and stronger the child, the more this is necessary (Fig. 93). The patient is held on the lap of the nurse, who passes her right hand around the child's body. The child's head rests on the nurse's right shoulder, firmly held in position by her left hand. If the

child be large and strong, a third person may be required to hold the head. After the gag is in position, the operator, with instruments and hands disinfected, holds the introductor in his right hand, locates the glottis with the forefinger of the left, and, using it as a guide, directs the tip of the tube into the larynx. He must be certain that the tip is properly placed before exerting pressure to put the tube into position. This can readily be appreciated by one who has practised on the cadaver. When the tip of the tube positively is engaged in the glottis, gentle pressure will put it into final position. Force should never be used, even when the tube is started right, for the child may require a smaller tube than his age indicates. This is rather unusual, however, as are the cases which require larger tubes than the age calls for. When the tube is easily coughed up, it is my custom to introduce the next larger size. With the tube in position, the obturator is quickly removed. I never trust to pressure on the shank of the introductor to disengage the obturator, but keep the guiding index-finger of the left hand on the expanded head of the tube in order to insure its remaining in position during the extraction of the obturator.

Results of Intubation.—After the operation the child who has previously been struggling will take a deep inspiration and cough. One of the most welcome sounds to the operator is the sharp rattle produced by the passage of air through the mucus which has been forced into the tube. This tells him that the tube is in position and that speedy relief of the stenosis may be expected. The intubated child will usually cough vigorously for several minutes, and in so doing may bring up a quantity of mucus and shreds of membrane. I have often been astonished at the large pieces of membrane and the quantity of thick mucus that can pass through the comparatively small lumen of the tube. In a few cases the presence of the tube in the larynx has caused such a persistent cough that a sedative was required to control it. Small doses of bromid of soda—four grains every half-hour for two or three hours, for a child four years of age—usually answer the purpose. The thread, looped and knotted, which has been attached to the tube, should be long enough to extend four or five inches beyond the lips. In case relief to the stenosis is not immediately perceptible after the operation, or if the breathing is made more difficult, one may be sure either that the tube is not in position or, if in position, that it is plugged with membrane, or that membrane may have become disengaged and is pushed downward ahead of the tube. A tube in the esophagus, where, in my hospital service, I have seen it placed by interns, may exert sufficient pressure upon the posterior portion of the larynx effectually to impede respiration.

Illustrative Case.—Several years ago I was called to intubate a boy two years of age who was suffering from moderate stenosis due to diphtheria. The tube was easily introduced, but its introduction was followed by entire cessation of respiration. The tube was immediately extracted by means of the attached thread and was found to be plugged with membrane requiring considerable pressure with a wooden toothpick to dislodge it. The stenosis was somewhat relieved as the result of dilating the parts and a removal of a portion of the membrane, but not sufficiently to furnish permanent relief to the patient. The tube was again introduced, followed by a complete relief of the stenosis.

Displacement of the Membrane.—When membrane is dislodged and pushed ahead of the tube, it will usually be expelled by coughing after the extraction of the tube.

Illustrative Case.—A case of this nature, following the withdrawal of the obturator, occurred in a child six years of age, whose breathing, before difficult, was impossible. The child struggled violently, became much excited, and with one hand free, knocked the gag from its mouth. In my efforts to extract the tube the string broke, and while introducing the gag in order to use the extractor, the child's struggles and attempts at coughing dislodged both the tube and a large amount of membrane, one piece of which, inclosing the tube, came out as a perfect cast of the larynx and upper trachea. The relief was immediate. Reintubation was not attempted, nor was it later necessary. The child had been given 5000 units of antitoxin twenty-four hours before, which helps to explain the dislodgment of the membrane.

Removal of the Tube.—When the patient is progressing satisfactorily, the question arises: How soon may the tube be removed? I rarely remove it before the fourth day after intubation. I find that when it is taken out on the second or third day, for cleansing or other purposes, it must usually be replaced.

Necessity for Intubation.—With the introduction of antitoxin, the necessity for intubation has become less frequent. The free use of antitoxin,—5000 to 10,000 units as an initial dose,—given with the first sign of obstruction, and repeated at eight-hour intervals until two, three, or more doses have been given, will render intubation a still rarer necessity. I do not feel safe in these cases until 15,000 or 20,000 units have been given. Fortunately, in laryngeal obstruction due to diphtheria the stenosis is usually of gradually increasing severity, so that by the early use of antitoxin many cases are relieved before the necessity for operation arises.

SCARLET FEVER (SCARLATINA)

Scarlet fever has been clearly recognized for many centuries although its early history is exceedingly obscure. The disease has always been most prevalent in civilized portions of the world, has shown remarkable differences in the severity of its separate outbreaks, and in almost all instances notably refrained from attacking a certain proportion of exposed individuals, in this respect contrasting sharply with measles, which exhibits no such selectiveness.

Jurgensen has reported an epidemic which in the years 1873 to 1875 ravaged the Faroë Islands, where for at least half a century the inhabitants had not been exposed to the disease and where the geographic conditions rendered observations on its course unusually easy. Here the discovery was made that, from a population comprising all ages and certainly not protected against scarlatina by a previous attack, only 38.3 per cent. suffered from the epidemic, whereas a similar study of measles in the same locality showed that 99 per cent. of the population unprotected by previous infection were attacked. It was furthermore observed that the susceptibility to scarlet fever was about seven times greater in persons under twenty than in those over forty.

The records of certain European epidemics exhibit a mortality as

high as 30 per cent., contrasting with a rate as low as 3 per cent. for the same place at another period. In New York State scarlet fever easily ranks among the dozen most prominent causes of death, usually causing a comparative mortality of five, to four of measles and six of typhoid.

Recent studies of the disease have been devoted extensively to a search for the specific cause, our ignorance regarding which is now the most serious obstacle in the management of cases.

Etiology.—The specific etiologic factor in scarlet fever has not yet been isolated. It is apparently present in the blood, throat, desquamating scales, and discharges from complicating otitis and other suppurations. Inclusions in the polymorphonuclear leukocytes have recently been described as found in 30 cases of scarlet fever by Dohle, and confirmed by Kretschmar and by Nicoll and Williams. The inclusions would seem, however, to be non-specific, since they are present in cases of other streptococcal infections.

Positive inoculations of scarlet fever into chimpanzees have been reported by Landsteiner, Levaditi and Prosek, and positive experiments with lower monkeys by Bernhardt. These results, as yet, lack confirmation.

Bacteriology.—Streptococci are found in the throat almost invariably in the early stages of scarlet fever, and they may be present in the blood and lymph-nodes late in the disease or after death. Kolmer's studies show that the streptococci found in scarlet fever are not specific in their serum reactions, and Weaver found that they are morphologically and culturally like streptococci isolated from lesions other than those of scarlet fever. The rôle of this coccus is probably that of a secondary or accompanying invader, causing or increasing the suppurative complication.

Transmission.—Scarlet fever is usually transmitted through association of the diseased with the unprotected. There seems to be substantial ground for the belief that the contagion may be carried by an intermediary. Milk is a well-recognized means of conveyance.

Contagion.—It is the least contagious of the contagious diseases. I have repeatedly known a child to develop scarlet fever in a ward with several others, none of whom later developed the disease, as they were confined to their beds, and consequently kept from any immediate contact with the patient.

The most contagious period is during the first three or four days of the illness. The danger of transmission during the period of desquamation is much less than is generally believed. Since little or nothing of the nature of the infecting agent is known, it is not wise to make definite statements respecting the period of communicability. My observation, however, in a great many cases in institutions and in private work, leads me to believe that the desquamation will some day be proved to be seldom, if ever, a carrier of the disease. Of late, many authors are inclined to place less emphasis upon the possible contagion from cutaneous scales and more upon the infective character of the nasal and aural discharges.

Evidence is at hand showing that books, clothing, flowers, and foodstuffs are means of conveyance from the diseased to the unprotected. From my own observation, I have never known of a case having been contracted in any of these ways. I have, however, seen a great many cases of scarlet fever which, ordinarily, would have passed undiagnosed if the patient had not been suspected because of exposure. I see cases frequently in which a positive immediate diagnosis is quite impossible.

Illustrative Case.—During the visitation of scarlet fever to a family, four children were attacked. Dr. S. Finley Bell had treated the two other members of the family at Englewood, a suburb of New York. A trained nurse caring for the children contracted the disease and died. Later, a girl six years old died with the disease. On one of my visits to one of the children who had been sent to New York city and later developed the disease, a member of the family called my attention to the arms of the laundress, which were slightly reddened. It was Monday morning and she was washing. She had no temperature, a normal throat, no rash except upon the arms, and felt well and was annoyed that she should be disturbed in her work. The redness of the arms disappeared after the completion of the washing, and nothing further was discovered until two weeks later, when she was found to be desquamating profusely on the hands and feet and slightly over the body generally. She was sent to the Willard Parker Hospital, where she required two weeks to complete the desquamation. Here was a case in which a most careful search failed to reveal any conclusive evidence of scarlet fever, and yet the woman had the disease at the time of examination.

There is strong probability that many of the cases of obscure origin are contracted by exposure to such atypical cases, rather than through infected milk, books, articles of clothing, or intermediary human carriers.

Susceptibility.—The most susceptible age is from the second to the twelfth year. Cases occurring in children under one year old are rare. The very young appear to possess a distinct immunity.

Illustrative Case.—During an epidemic at the New York Infant Asylum at Mt. Vernon, N. Y., a colored boy was found to have the disease in a very active form. The institution was built on the cottage plan and this boy, 28 runabout children, and 4 nursing women orderlies with their 4 nurslings occupied the ward on a second floor in one of the two-story cottages. The institution, comprising 400 children and about 200 women, was crowded.

To break up the ward would have meant that the exposed children, some of whom would probably develop scarlet fever, would be placed with unprotected and unexposed children. It was, therefore, decided to quarantine the ward with its inmates. Every child in this ward developed scarlet fever except the four nurslings, who at the time of the outbreak were under three months of age. Three of the women also escaped. The fourth woman developed the disease and had a moderately severe attack, during which time she nursed her infant, which remained well. It is of interest that so effective was the quarantine that the disease did not spread beyond the ward in which it developed.

Second Attacks.—One attack almost always protects from subsequent attacks. I have seen but two undoubted instances of a second attack, one of which occurred after an interval of four months in a boy of six years, the child dying on the fifth day of the illness; the other in a girl twelve years of age, whose previous attack was four years earlier. In the girl the second attack ran a typical but uneventful course.

It is interesting to note that an unprotected individual may be repeatedly exposed and only at a late period develop the disease. Thus, during an intern service in the institution referred to, where I cared for 108 cases of scarlet fever, and the epidemic was severe, requiring that

many children be seen several times a day, three months of daily and sometimes hourly exposure transpired before the unmistakable signs of the disease became manifest in me.

Incubation.—The period of incubation is variable. It is rarely less than five days. If an exposed child passes the ninth day in safety, the disease will probably not develop later. I have known one case to develop after twelve days' exposure, and one on the fourteenth day following exposure. So long a period of incubation, however, is exceedingly rare. Cases reported as developing after a very long exposure,—three to four weeks,—result from later exposure which was not known.

Symptomatology.—Nearly all the characteristics of the disease are subject to wide variations. Even the rash, the most constant symptom, may be simulated by sepsis or produced by drugs. Among the diseases of children which we are called upon to treat there is, furthermore, none other which may present itself in such unusual and peculiar ways.

The three symptoms upon which some reliance may be placed are *fever*, *angina*, and the *rash*. Any one of these, however, may be absent in the mild cases. In the moderately severe cases the onset is usually abrupt, with fever, angina, prostration, and vomiting, and, after twenty four to twenty-eight hours the developing rash, which is usually fairly characteristic. The angina causes a diffuse redness of the mucous membrane of the fauces and tonsils, and on the soft palate above the uvula minute red points become visible which may coalesce, forming diffuse, small, injected areas, and producing a blotched appearance.

There is loss of appetite and always thirst. The child is irritable, and if old enough, complains of headache and muscle soreness. The temperature furnishes a fairly accurate index of the severity of the disease. The mild cases have little fever, while the severe cases almost always have a high temperature. Thus a temperature range from 103° to 105° F. will usually be accompanied by a well-marked rash and prostration, which tell us that the poisoning is severe. When the temperature remains above 103° F., the child is very uncomfortable and complains much of itching.

The eruption remains at its height from two to six days, which may be looked upon as the period of the rash. With a subsidence of the rash, the temperature falls gradually to normal.

Desquamation.—Coincident with the fading of the rash the desquamation usually begins. It may be delayed, however, from this time until the third or fourth week. In a very few cases I have known the rash to last longer than the tenth day. It may show great irregularity in its duration.

Illustrative Case.—During our epidemic of scarlet fever every child in the institution was carefully inspected three times daily. At 5 P. M., the time of the last inspection for the day, a boy of two years had a temperature of 102° F., an unmistakable rash over the left buttock and thigh, and some redness of the throat. There was but little prostration. He was quarantined, and six hours after his isolation the rash faded absolutely. His fever promptly subsided on the same day. In spite of the suspicion of a mistake in diagnosis, inasmuch as he had been placed in a scarlet fever ward and exposed, we had to keep him there. Greatly to our surprise, on the tenth day free desquamation began.

When uncomplicated, the average case goes on to recovery, with completed desquamation in from two to four weeks.

The shedding of dead epidermis may be most variable in its manifestations. I have seen the skin of the hands and feet shed like a glove "en masse," and I have seen one case in which the rash was equally well marked in which there was no desquamation of any nature at any time. There has been desquamation, however, although it may be very slight, in nearly all scarlet fever cases coming under my observation. There may be but slight peeling of the fingers and toes. The heel and the plantar aspect of the fingers and toes are the sites usually selected when the desquamation is scanty.

Second Desquamation.—I have seen two cases of second desquamation. The first patient was a girl of five years, who completed the first desquamation and was free for six weeks, when the desquamation again occurred on the hands and feet and required three weeks for its completion. In the other case, that of a girl twelve years of age, the second desquamation appeared three weeks after the completion of the first. It involved only the feet, and was of two weeks' duration. The amount of desquamation bears a fairly definite relation to the severity of the rash, excepting in the anomalous cases.

Severity.—The illness may be of the mildest type, and impossible of positive diagnosis, or it may be so severe that the child will live only a few hours. My shortest fatal case lasted thirty-six hours from the onset of the symptoms. The child was never conscious after the first invasion, and the temperature was never below 106° F., nor could it be reduced below this point.

Such cases as these, in which the system is absolutely overpowered by the scarlet fever poison, are extremely rare. The disease, when fatal, is usually so through its complications.

It has not been my observation that the presence of wounds in any portion of the body renders a person more liable to scarlet fever.

Diagnosis.—The diagnosis in many cases is very easy. In some it is difficult, and in others impossible. We have no positive means of proving our case clinically or bacteriologically. Not only are the mild cases difficult of diagnosis, but also the very severe cases. In malignant cases the patient may die before the development of characteristic signs, or the signs may be so masked by the severity of the infection as to render diagnosis impossible.

Our means of diagnosis are the angina, which occasions a diffuse, intense general redness of the throat, the fever, and the diffuse blush of the skin, which in twelve or twenty-four hours develops into a diffuse punctate rash usually appearing first and most characteristically over the lower abdomen, in the groin, on the inner aspect of the thighs, and over the buttocks, and thence extending to, and involving, the entire skin surface.

It has not been my observation that the rash first appears on the neck and chest, as has been claimed by different writers. The so-called strawberry tongue is of no differential value, for it may occur in many other forms of illness.

Complications.—Probably no other disease of infancy or childhood is so fertile in serious complications as scarlet fever. In fact, comparatively few die from the direct effects of the scarlet fever poison. A streptococcus infection of the throat is present in all cases of any degree of severity. This I have demonstrated in dozens of cases, and it is the throat as a culture field for the streptococcus that is the great source of danger in the disease.

Membranous non-diphtheric angina has always been of streptococcal origin in my cases. On inspection, the exudation resembles that of true diphtheria and our only means of differentiation is the making of a culture. Such a membrane may involve the nasal passages, but rarely extends to the larynx. I have seen but two cases of membranous laryngitis of proved streptococcal origin, and these were not in scarlet fever patients. The local infection may be sufficiently severe to cause extreme necrosis.

Illustrative Cases.—In one case I had been engaged to remove a pair of very large tonsils. This boy developed a very severe scarlet fever before the time appointed for the operation. On his recovery the throat was as free of tonsil tissues as if they had been carefully enucleated.

In a fatal case necrosis of the soft palate occurred, resulting in a perforating ulcer larger than a dime.

True diphtheria occurs as a complication in a very small percentage of the cases of scarlet fever. Before our knowledge of the Klebs-Löffler bacillus, much was heard of diphtheria as complicating scarlet fever, and this because of the presence on the tonsils of membrane, which we now know to be of streptococcal origin.

Adenitis.—From the throat the glands may be infected. The lymphatic glands at the angle of the jaw and the retropharyngeal glands are, by reason of their location, the most frequently involved. Suppuration of the glands and abscess are very frequent results, and diffuse edematous cellulitis of the neck is an occasional result of such infection.

Cases have been reported in which the pus burrowed into the mediastinum, causing septic endocarditis and empyema.

Pericarditis and endocarditis have been very rare complications in my cases, and have always been fatal, for the reason that such cases are always purulent, of streptococcal origin. I have had cases when it seemed that there must be an endocarditis, but which recovered entirely too promptly to have had this complication. In these instances there probably was an acute dilatation which had given rise to the murmur.

Myocarditis of a mild degree is often present at autopsy. Lobar pneumonia is a very unusual complication.

Bronchopneumonia is found at the autopsy in nearly all the fatal cases. The development of the disease during an attack of scarlet fever is of very grave importance.

Otitis.—Otitis is a frequent and dangerous complication of scarlet fever. If all cases, the mild, the moderately severe, and severe, are included, it will be found in over 10 per cent.

Albuminuria.—Early in the average case albumin will be found in the

urine, if this is repeatedly examined and with sufficient care. This condition does not constitute nephritis, however, for albumin in small amounts will be found in most diseases of toxic origin in childhood.

Nephritis.—Scarlatinal nephritis rarely appears before the third week of the disease. I have known cases to develop as late as the twelfth week after the onset. The nephritis is of the glomerular type, and more likely to occur after mild infections. The first sign will usually be that of a puffiness under the eyes and about the ankles. The urine becomes scanty and high colored. This complication will be referred to again on p. 636.

Arthritis.—Joint complication has been present in but 5 per cent. of my cases. The arthritis is the manifestation of a local infection. There may be swelling and redness of two or more of the joints. The lesion has always been multiple; I have never known one joint alone to be involved. In some cases pain alone will be present, without either of the above symptoms. A fatal case of pyemic arthritis was seen by me in consultation with the late Dr. McInerny, of New York. The joints at the knees, ankles, elbows, and wrists suppurated. This child died.

Mortality.—The mortality varies greatly. Different epidemics give a different mortality. In institution epidemics the mortality is higher than in private life. In the New York Infant Asylum, during my service, the mortality in children under six years of age was 20 per cent. In private work the average mortality ranges under 10 per cent.

Prophylaxis.—The most efficient safeguard is a normal throat. The presence of enlarged tonsils and adenoids doubtless increases the susceptibility to the disease, and their presence adds greatly to the dangers.

Quarantine.—The isolation of those ill with contagious diseases is an absolute necessity for the protection of others. While it is advisable in cases of scarlet fever to remove from the house children who have not had the disease, and, in the event of diphtheria, all children, regardless of previous attacks, such removal is often impossible. It then becomes our duty to establish such a quarantine as will be effective in preventing the transmission of the disease. In order to do this, the child and the attendant must not come in contact with other members of the family, whether children or adults. If the residence is a city or a country house, one or two rooms on the top floor should be selected for the patient, the room from which he was removed being carefully cleaned and disinfected. If the family occupy an apartment, an effective isolation is more difficult, but is by no means impossible. In such circumstances the room or rooms must be as remote as possible from the other living-rooms. The room in which the child is placed should be prepared for the patient according to the instructions laid down on p. 631. Not only should the attendant not come in direct contact with other members of the family, but there must be no indirect contact through dishes, feeding utensils, clothing, or bed-linen. The dishes, knives, forks, and spoons should be placed in boiling water and in this sent to the kitchen. The

clothing, towels, and bed-linen should be placed either in boiling water or in a carbolic solution—one ounce to two gallons of water—before sending them to the laundry. Upon their arrival at the laundry they should be boiled at once. A chair outside the door of the sick-room may be used as a receptacle for the various articles for the patient, which are to be removed only when the person who brought them is at a safe distance.

Two isolating rooms are better than one, and if there can be a connecting bath-room, it is much more agreeable to the occupants. If two rooms are devoted to the patient, one is to be used for day and the other for night occupancy, the unoccupied room being freely ventilated after the removal of the child. Observing the above precautions until the child is well, I have repeatedly carried through to successful convalescence cases of diphtheria and scarlet fever while other unprotected children have remained in the household during the entire illness without taking the disease.

An incident, previously referred to, which well demonstrates the value of proper quarantine, occurred at the New York Infant Asylum, Mt. Vernon, New York, during my service as intern in that institution. The institution was built on the cottage plan, two wards in a cottage. A colored child, an occupant of one of the upper wards, was discovered to be ill with scarlet fever. There was an extensive rash, considerable swelling of the cervical glands, and the whole aspect of the case was that of scarlet fever at its height. Through the negligence of an orderly the child had probably been ill two or three days before our attention was called to him; as a consequence, 30 other children of the ward had been exposed. In order to prevent the spread of the disease to the other 400 children, it was decided to quarantine the ward with its children and the 4 attendants. This was done. Twenty-six children and 1 woman attendant developed the disease. The quarantine, on the plan above suggested, was continued for ten weeks. The thirty or more children on the ground floor of the cottage remained there as before, but no other case developed in the institution. In order to prevent the spread of the contagion, there was no personal contact with those outside of the ward, except on the part of the physician who visited them daily, but who always went properly protected. All clothing and bed-linen were boiled before being removed from the ward. The dishes and feeding utensils were likewise boiled before being sent to the general kitchen.

If such isolation is possible in an institution among the careless and more or less ignorant, it certainly should be equally effective among the intelligent, who are most interested in preventing the spread of disease.

When the quarantine is raised, the child should receive a bath of hot water and thorough scrubbing with plenty of soap. A few hours later a bath of bichlorid 1:3000 should be given. If the hair is cut short and shampooed with green soap, followed by the bichlorid, the disinfection is more complete.

Treatment.—The patient must be kept in bed throughout the entire

illness, of from four to six weeks; *i. e.*, from the onset, first manifested by sore throat and fever, until the desquamation is completed (see Quarantine, p. 629). We must realize at the outset the possibilities due to the virulence of the infection and the complications. The death-rate in scarlet fever epidemics varies from 10 to 30 per cent. In greater New York from 350 to 450 children under ten years of age die from scarlet fever or its complications every year. In order to do our full duty to the patient we must place him in the best possible position for successfully combating the disease.

The Sick-room.—The sick-room should be as large as it is possible for the family to supply. It is desirable that it be well lighted by two windows which will make free ventilation possible. For the latter purpose, the window-board (p. 150) answers well. There should always be a direct communication with the open air, except when the child is being bathed or the clothing changed. Light and the free circulation of fresh air are absolutely necessary for the proper management of a severe case of scarlet fever. If possible, two rooms should be used—one for the day, the other for the night. The room which is not occupied should have the window or windows wide open. When nephritis, endocarditis, or otitis develops, they are the result of the scarlet fever poison or associated infection, and not due to the fact that a window was left open.

Clothing.—The child requires no extra jacket or wraps. The customary night-gown, with the light gauze undershirt and the usual bed-covering, is all that is required.

Urine Examinations.—The urine should be examined for albumin every day. It is my practice to have the family get a few test-tubes and a bottle of chemically pure nitric acid. When the busy physician has the daily specimen sent to his office or carries it home himself, it is sometimes forgotten, misplaced, or lost. During convalescence, when the daily visit is not made, the nurse or some intelligent member of the family may be instructed to make the test and report if trouble is discovered. Because of a lack of these precautions, nephritis may easily be overlooked until puffiness about the eyes and edema of the lower extremities are discovered by the attendant after albumin has been present in the urine for several days.

Diet.—In the bottle-fed during the acute febrile stage the food strength should be reduced one-half by the use of boiled water. If the child is getting eight ounces of a milk mixture, four ounces of this mixture should be given with four ounces of water. For older children, the diet should be considerably restricted not only during the acute stage, but during the entire course of the disease. During the acute febrile stage diluted milk, gruels, and orange-juice should constitute the diet. To a child from two to four years of age, 5 ounces of milk with 5 ounces of barley gruel No. 2 (see formulary, page 103) may be given at four-hour intervals—4 or 5 feedings in twenty-four hours, which make an acceptable diet. Variations may be made in the gruels used. Wheat, rice, and granum may all be brought into use, made as suggested in the

formulary and given with equal parts of milk. It is always well, in the feeding of sick children, to provide for some variety in the food, in order that the child may not tire of it. The juice of one-half an orange may be given twice daily, three hours after the milk and the gruel feeding. For the sake of variety I occasionally allow a glass of whey or kumyss, or a glass of skimmed milk containing ½ ounce of lime-water. Toasted bread, zwieback, or plain crackers, dry or in diluted milk, may be given occasionally.

Milk Diet.—The exclusive milk diet in the management of scarlet fever, about which we have all heard and still hear a great deal, has not been so successful in my hands as has the foregoing. My observation has been that the exclusive milk diet is apt to produce constipation, intestinal indigestion, coated tongue, loss of appetite—that, in fact, the child "grows stale" on the milk, which is to be our dietetic mainstay during the weeks that are to follow. During the post-febrile period slight additions should be made to the diet by the use of farina, hominy, wheatena, and the lighter cereals, prepared as porridge with a sprinkling of sugar and a little milk. The child's customary diet should not be resumed until four weeks have elapsed from the commencement of the attack. If the case has been a severe one, showing marked systemic infection, six weeks should elapse before the full diet is resumed.

Bowel Evacuation.—There should be one evacuation of the bowels daily. If this does not take place, a soap-water enema should be given. If, on account of the diet and the recumbent position, there is a tendency to constipation, a glass of malted milk—6 teaspoonfuls of the malted milk to 8 ounces of water—as a part of the evening meal will be of service in relieving the condition. The addition of one teaspoonful of cocoa will be acceptable when the taste of malted milk is objectionable.

Laxatives.—As a laxative during the acute febrile stage, citrate of magnesia is very satisfactory. As a rule, children like it, and to those from two to five years of age it may be given in doses of from 2 to 4 ounces. In case it is not well taken, from one to two teaspoonfuls of the aromatic cascara may be given.

Specific Medication.—There is no specific medical treatment for scarlet fever. Many of my cases have passed through the entire illness without the use of any other measures than those suggested above.

Serum Treatment.—The value of the serum treatment has been by no means demonstrated, and its use is not advised. The preparation of serum and its use before we know the nature of the scarlet fever poison is, to say the least, premature. The only use of therapeutic measures, so far as we know at the present time, regardless of the kind employed, is to assist the organism in battling with the disease.

Nursing.—As the course of scarlet fever is distinctly cyclic in character, much can be done in the most severe cases to prevent complications and to relieve the patient of his temporary burden. Since one of the most important offices we have to perform is to keep the vital force at the highest possible point, we must do everything in our power to preserve the natural resistance of the patient, and this we have done in no

small degree when we have so arranged for clothing, diet, fresh air, bowel evacuation, sleep, and quiet as to insure the child's comfort and well-being. The amount of vitality wasted by an uncomfortable, restless child in twenty-four hours may turn the case from a successful to a fatal issue.

I fully believe in "spoiling" a sick child. If a child is more at ease with the mother, the mother's place is with the child. If the mother's presence disturbs the child, as it does in some instances, she should be kept in the background. If it is apparent that the nurse selected is not to the child's liking, or not adapted to the case, another nurse should be secured. I have been obliged repeatedly to take my best nurses from children gravely ill, because the patients were irritable and unhappy in their presence.

Quiet.—Quiet is most necesssary. One person only should be allowed in the sick-room with a child very ill. A second person is of no service, and if admitted, vitiates good air. Moreover, it is not to be expected that two persons of the "female persuasion" in the same room will not talk!

Control of Fever.—I find it a safe rule not to allow the temperature to go much above 104° F. A higher temperature than this necessitates an overworked heart. For the purpose of controlling the temperature, a fifteen-minute sponging every hour with water at 90° F. may be tried.

Packs.—If sponging does not answer, the pack (p. 749) should be brought into use. The mere existence of a rash is no contraindication to the application of moderate cold to the skin. The pack may be used in scarlet fever, just as in pneumonia or typhoid fever. The fear that the disease may "strike in" and kill the patient is one of the many inexplicable ideas of the laity with no foundation in fact. The child is placed in the pack at 95° F. It will rarely be necessary to reduce the temperature of the pack below 80° F. If the case is of the fulminating type, with persistent high temperature, the pack may gradually be reduced to a temperature of 70° F. In thus reducing the temperature the towel is not to be removed from the patient. He is turned from side to side and the towel moistened with water at the desired temperature. Time and again I have seen a child who was tossing about the bed, delirious and sleepless, fall into a quiet sleep when placed in a pack. With a reduction of the temperature there is a corresponding diminution in the pulse-beats of from 20 to 30 a minute. When we think what a saving this is to the work of the heart, the benefit is most apparent.

Tub-baths.—The full tub-bath at a temperature of 95° F. for ten minutes at the commencement of a case in which there is a great deal of restlessness and irritability will often act most satisfactorily in quieting the patient. Tub-bathing, however, requires a great deal of handling of the patient, and in the cases in which there is persistent high temperature, and in those in which it mounts up suddenly after the bath, the pack is by far the more satisfactory. In some cases with intense prostration and high fever and cold extremities, the warm bath—105° F. to

110° F.—for ten minutes will have a most satisfactory effect. The fever is reduced, the child is quieted, and the heart action improved.

Oil Inunction.—The itching and burning of the skin in scarlet fever is most distressing. This is relieved to a considerable degree by the pack. The child's comfort will also be greatly enhanced by an inunction twice daily of cold-cream or liquid albolene. Vaselin or olive oil may be used, but they are much less satisfactory. Vaselin will act as an irritant to some sensitive skins.

During the period of desquamation the oily applications largely prevent a free distribution of the scales.

Stimulants.—If during sleep the pulse is over 150 a minute, and the cardiac first sound is weakened, a heart stimulant is necessary. To a child one year of age one drop of tincture of strophanthus at two-hour intervals, or an equal amount of the tincture of digitalis, should be given. On account of its being well borne by the stomach, the tincture of strophanthus is always to be preferred. Strychnin is a remedy of considerable value as a heart stimulant. When the pulse is soft and the heart action shows a tendency to irregularity, $\frac{1}{200}$ grain may be given every two to four hours to a child from one to three years of age, and $\frac{1}{150}$ grain to a child from three to six years of age, at intervals of from two to four hours. Alcohol should be used only in the septic, asthenic cases when other means of stimulation have failed. In such instances it should be used freely. In a few cases I have used it in very large quantities with striking benefit. One-half dram of whisky, at first given every two hours, may be increased gradually until its beneficial effects are noticed on the heart action. It is astonishing how much alcohol may be given, in a profoundly septic case, without the slightest effect, except an improvement in the heart action, and a corresponding improvement in the child's general condition.

Care of the Throat and Nose.—The throat and nose demand our attention during the acute stage. For the nose toilet in older children, a solution of menthol and liquid albolene may be used by means of an atomizer, and in the very young by instillation with a medicine-dropper. Forcible syringing of the nose in a young child is not a safe procedure even in the most skilled hands. Local treatment of the throat depends entirely upon its condition. If the mucous membrane is swollen, edematous, and covered with a glairy, mucopurulent secretion, if there is a pseudomembrane, or if there is much pain or discomfort upon swallowing, local treatment is required. The child should be made to gargle, if old enough; or, far better, the throat may be irrigated with hot saline solution at 120° F. This is done in the manner described on p. 277. Force will be required with the very young. In older children the relief from pain that is experienced from free irrigation is so great that usually the child takes the tube in the mouth gladly for the future irrigations. The use of antiseptic gargles and washes has not seemed to me to possess any value other than that of cleanliness, and free douching accomplishes this in a far more satisfactory manner.

Treatment of Complications.—*Cervical Adenitis.*—Cervical adenitis

is a very frequent complication of scarlet fever, and when suppuration occurs, it is most troublesome. On the first appearance of a swollen gland, an ice-bag should be applied and then kept on constantly day and night.

This is a very difficult procedure with many children. When trouble is experienced in using the ice-bag, a cold compress (p. 282), with water at 50° to 60° F., changed every thirty to sixty minutes, will answer almost as well. Several thicknesses of old linen, such as are furnished by a table napkin, answer well as a medium for applying the cold. The material used should be cut of sufficient length to extend from ear to ear under the jaw. In order that the moisture may be retained, oiled silk or rubber tissue may be placed over the dressing, and over all a thin gauze bandage, which is pinned together on top of the head.

When either of the above measures is not practicable, 30 per cent. ichthyol in zinc ointment should be kept bound on the parts, the application being renewed every three hours. Cataplasma kaolini may also be used. It is spread on a piece of linen and applied over the swollen area. It should be renewed at six-hour intervals. Whether the ice-bag, the ichthyol, or cataplasma kaolini is used, Credé's ointment may be given a trial, 10 grains being rubbed into the skin over the swollen gland for fifteen minutes twice a day.

Otitis.—Otitis is a complication in 10 to 30 per cent. of the cases of scarlet fever. In view of the grave possibilities of mastoid involvement, sinus thrombosis, and jugular bulb infection, the presence of pus in the middle ear should be promptly detected, and the pus evacuated by a free incision of the drum membrane. The presence of middle-ear infection may be suggested by a pain or a sensation of fullness in those old enough to locate it. In infants, restlessness, sleeplessness, or tenderness on manipulation in cleansing the ears may be the only objective sign of the trouble. In the majority of my cases of otitis, none of the above signs of pain and discomfort were present. The ear involvement was suggested because of a continued elevation of temperature which could not otherwise be accounted for. A persistent elevation of the temperature of unknown origin following scarlet fever is sufficient occasion for examination of the ears by an expert in otoscopy. As a routine measure during the fever, the condition of the drum membrane should be noted at least every second day.

As stated above, otitis develops in from 10 to 30 per cent. of the cases, depending somewhat upon the character of the epidemic, but more upon the age of the patient. The younger the child, the greater the danger of ear involvement. Many cases of deafness which we meet have had their origin in an attack of scarlet fever, and are due to somebody's ignorance or neglect. Among 185 cases of scarlatinal otitis reported by Bezold and quoted by Holt, in 30 there was entire destruction of the membrana tympani; in 59, the perforation comprised two-thirds or more of the membrane; in 13, there were small perforations; in 44, there were granulations or polypi; in 15, there was total loss of hearing on one side, and in 6 of the cases upon both sides; in 77, the

hearing distance for low voice was less than twenty feet. May, of New York, has collected statistics of 5613 deaf-mutes, of whom 572 owed their condition to otitis following scarlet fever. When we consider how many cases of permanent ear defects have occurred and do occur every year as a result of carelessness or lack of even an elementary knowledge of aural diagnosis, we do not feel inclined to congratulate the members of the medical profession on their ability to complete their cases. The bacteriology of scarlatinal otitis is the same as in suppurative otitis developing with or following any other infectious disease, except that there is a greater tendency to severity because of the liability to streptococcus infection. Prompt relief demands prompt recognition of the condition of the drum membrane, with evacuation of the pus and suitable after-treatment. (See Acute Suppurative Otitis, p. 636.) This will not be possible if the practitioner does not examine the ears or is not sufficiently expert to recognize a diseased condition when he sees it.

Cardiac Involvement.—Heart complications are not particularly frequent in scarlet fever. Nevertheless the heart should be examined daily. In my own observations, they have been present in about 2 per cent. of the cases.

Nephritis.—Early in the cases of severe infection there will often be discovered a transient albuminuria with a few hyaline casts. There may be slight suppression of the urine. In but one of my cases was there complete anuria at this stage of the disease. Within thirty-six hours, however, after the first sign of the disease in this case, the kidneys ceased to act, and the child died on the third day, from the acute diffuse nephritis. The condition of the kidney giving rise to albuminuria is best relieved through attention to the skin function by the use of a bath at a temperature of 105° F. every six or eight hours. The child may remain in the bath for ten minutes, during which time the skin should be vigorously rubbed with the bare hand. The tincture of aconite in doses of one drop, with five drops of sweet spirits of niter for a child eighteen months of age, will usually produce a satisfactory skin action.

What is known as scarlatinal nephritis rarely appears before the third week of the disease. I have known cases to occur as late as the sixth week. The management of this complication will be found on page 429.

Arthritis as a complication of scarlet fever is seen in only a few of the cases—about 3 per cent. There may be swelling or redness of the parts, or both these symptoms may be absent. Whether or not the swelling is present, the joints are very painful on manipulation. Affected joints should be wrapped in old linen, saturated with lead and opium solution, and the dressing renewed every six hours. The following lotion has answered well in a few cases:

℞ Mentholis ..... ℥ij
Tincturæ opii ..... ℥iv
Spiritus vini recti ..... q. s. ad ℥vj

Soft linen is moistened with the lotion, wrapped about the parts, and covered with oiled silk or rubber tissue. The part affected is then wrapped in flannel or cotton-wool. The lotion may be freshly applied at intervals of from four to six hours. The only objection to its use is the odor of the menthol.

Internally, to a child four years of age, aspirin may be given in doses of five grains, with ten grains of the bicarbonate of soda at four-hour intervals, four doses being given in the twenty-four hours. Salicylate of soda may be used in small doses; but, as this may be badly borne by the stomach, aspirin is preferable.

Surgical Scarlet Fever.—This type of scarlet fever is described in the text-books; a few writers strenuously maintain its existence, while others doubt it. An inoculation of the disease is supposed to take place through an abrasion or wound. I have never seen a case of true scarlet fever acquired in such a manner. I have seen surgical cases, however, develop a septic rash that could not be differentiated from the scarlet fever rash. In such patients the skin will desquamate on the body generally, but not on the hands and feet. There is no angina. Further, I have never known a case of this nature to transmit the disease to others.

TYPHOID FEVER

Typhoid fever is not a disease common to infants or very young children. Persons of any age may acquire the disease. It has been established that the fetus may be infected by the mother. Different observers have proved that bacilli in the fetal organs and blood have reacted to the Widal test. Numerous cases are reported as occurring during the first months of life, but the fact that these cases are reported singly, and that such reports are commented upon and quoted by other writers, emphasizes the statement that typhoid in the very young is extremely rare. In a large hospital and private experience, covering many thousands of cases of acute illness in children, during a period of nearly twenty-five years, I have seen but four cases of proved typhoid in children under two years of age. The youngest was eight months old, and another ten months old.

Bacteriology.—Bacillus typhosus was described by Eberth in 1880 and cultivated by Gaffky in 1884. It is short, it does not retain Gram's stain, and grows readily upon all ordinary laboratory media. The characteristic features of the organism are its viability and its inability to produce gas in any sugar medium. The Bacillus typhosus enters the human body through the gastro-intestinal tract, usually by means of polluted water, which, in turn, may contaminate milk, vegetables, and oysters. During the course of an attack of typhoid fever Bacillus typhosus may be cultured from the blood, rose-spots, feces, the urine, and exceptionally from the sputum. The bacilli are found in the blood in practically all cases of typhoid fever, most frequently during the first week, less frequently in each succeeding week. In the feces the bacilli do not, as a rule, appear until the second week, when ulceration has

begun; they remain present until convalescence is established. The urine rarely contains typhoid bacilli before the end of the second week of the disease, when they are present in about 25 per cent. of all cases. The urine may continue to show the bacilli for weeks or months after convalescence. In the gall-bladder the bacilli have been found years after an attack of typhoid fever.

Bacillus typhosus is found in pus from complicating, suppurating lesions in typhoid fever, such as periostitis, osteomyelitis, synovitis, meningitis, peritonitis, and abscesses.

Typhoid carriers are estimated by Russell to develop from about 3 per cent. of all typhoid-fever patients. These persons may excrete the bacilli with the urine or feces for many years after an attack of the disease, and are, therefore, a menace to those about them.

Immune bodies develop and circulate in the blood of the patient with typhoid fever. One kind of immune body is the agglutinin, whose presence is demonstrable by the Gruber-Widal reaction. This agglutination of typhoid bacilli by the diluted serum of a typhoid fever patient is not usually apparent until the second week of the disease, and may be delayed until the seventh week. The reaction is present, however, some time during the attack in 95 per cent. of all cases of typhoid fever, and is, therefore, a diagnostic aid of value.

Pathology.—The lesions produced by typhoid are usually much less severe in children than in adults. Autopsies upon youthful subjects have at times revealed no intestinal lesions sufficiently severe to warrant the diagnosis. In nearly all cases, however, the small intestine is the seat of a catarrhal process, and although there may be no actual ulceration, the solitary follicles and Peyer's patches are reddened and swollen. The spleen is almost always enlarged. Doubtful findings may be substantiated by cultures from the blood and intestinal contents. Parenchymatous degeneration of the viscera caused by typhoid is less frequent in children than in adults.

The details of the disease process have been well explained in the following paragraph from the work in pathology by Adami and Nicholls:* "According to Mallory, the essential feature of typhoid is a proliferation of the endothelial cells throughout the body, a change which he thinks is due to a diffusible toxin derived from the bacilli. The lesion in question is found in Peyer's patches, mesenteric glands, liver, and bone-marrow, as well as in the lymphatics and blood capillaries, but is proportionately more intense the nearer to the point at which the infecting agent gained entrance. The endothelial plates attached to the fibrous meshwork of capillaries proliferate, become fused into plasmodial masses or giant-cells, and act as phagocytes. They ingest the bacteria and slowly eat up the lymphoid cells, which thus gradually disappear. A few leukocytes are to be seen in the follicles, and within the crypts of Lieberkühn, but are not an important feature. Owing to the massing of these endothelial cells within the capillaries and the consequent obstruction to the blood-supply, the parts deprived of their nutrition undergo

* Adami and Nicholls: Principles of Pathology, 1909, vol. ii, p. 439.

necrosis. The focal necroses in the liver and spleen are to be explained in the same way."

Transmission.—Transmission may take place by different carriers, the principal ones being infected water, milk, uncooked vegetables, and shell-fish. That the disease is usually water-borne is admitted by all.

Symptoms.—I cannot agree with those writers who describe urgent symptoms early in a case of typhoid.

The early manifestations in a great majority of cases consist in moderate fever, becoming a little higher each day, apathy, and drowsiness. The tongue is coated and there is loss of appetite.

In children systemic poisoning from intestinal sources appears to have some selective action on the nervous system; thus, disturbed digestion, whether acute or chronic, is productive of dreams and night-terrors. Gastro-intestinal disturbances, more than any other factor, are productive of convulsions. In typhoid fever the central nervous system, similarly, is affected. The child is dull and apathetic. So indefinite are the signs that a diagnosis is impossible for days, and often it is just this feature of absence of diagnostic signs that arouses a suspicion of typhoid fever. Now and then a case is seen with stormy onset, high fever, delirium, and rapid pulse. In such cases there is usually an associated infection, such as an acute intestinal infection or one due to the pneumococcus.

Nervous Symptoms.—In mild cases the nervous manifestations may be slight or altogether lacking, or there may be apathy, drowsiness, stupor, and delirium. The temperature range and the nervous manifestations appear to bear little relation to each other; thus, with a low temperature range there may be pronounced stupor and delirium, suggesting the possibility of meningitis.

The Pulse.—The pulse-rate is a most characteristic sign. It is comparatively slow, decidedly out of relation to the temperature range—slower than in any other illness excepting meningitis. The pulse shows no irregularity in force or rhythm. I have seen the pulse at 110 with a temperature of 104° F. This, in itself, is a most suggestive sign.

The Spleen.—The spleen is usually enlarged, the enlargement corresponding with the severity of the attack. The organ is usually palpable some time during the second week, but in mild cases may never appear below the free border of the rib.

Gastro-intestinal Symptoms.—Tympanites is the rule; this condition may be extreme or of mild degree, or it may not exist. With suitable feeding, this feature may be largely eliminated.

Either diarrhea or constipation may be present; here also the feeding of the patient plays an important part. Patients who are fed with large quantities of milk will often have diarrhea or constipation, or the two conditions alternating, along with abdominal distention, high fever, and greater toxicity.

Rose Spots.—Rose spots may be absent, few in number, or scattered over the skin surface. They appear most often on the abdomen; but frequently also on the chest and back.

Temperature.—The temperature range is variable. In the case of a boy of ten years, who showed a positive reaction, the temperature lasted two weeks but was never above 100.5° F. by mouth. The usual range in my cases has been 101° to 103° F., perhaps occasionally reaching 104° F. It has been extremely rare for the temperature to continue after the eighteenth day. My shortest temperature record was that of a ten-year-old girl, the duration of her fever being ten days. In typhoid a very high temperature is not always a bad prognostic sign.

Illustrative Case.—In a girl whom I saw in consultation with Dr. Staub, of Stamford, Conn., there was a temperature range for eleven days of 104° to 106° F., and from 101° to 104° for ten days longer, the entire duration of temperature being thirty-six days. During the illness the child did not appear to be very ill.

This observation has been repeated in other cases.

Intestinal Hemorrhage.—Intestinal hemorrhage is very rare in children. *Perforation* I have never known.

Complications.—The complications of typhoid in children have been exceedingly rare in my experience with the disease, and fatalities have been of most unusual occurrence.

The fact that typhoid fever bacilli may be cultivated from the blood and urine implies that infection of various organs in the body may and does occur; thus the disease may cause pyelitis, peritonitis, meningitis, osteomyelitis, synovitis, otitis, and abscesses. When bronchopneumonia occurs with typhoid fever, it is usually a terminal infection.

Suspicious Diagnostic Signs.—Apathy, drowsiness, a gradually rising temperature-curve, with diarrhea and perhaps tympanites.

Diagnostic Signs.—Positive Widal reaction; elevation of temperature, and pulse slow in comparison to the temperature; involvement of the central nervous system, drowsiness, stupor, delirium, enlarged spleen, and rose spots.

The Widal test may be corroborated by culturing the blood and urine and by examination of the feces.

Differential Diagnosis.—Any continued fever of unknown origin, until very recent years, would have been called typhoid or malaria. It was only a few years ago that some of our best clinicians in this country and in other lands diagnosed as typhoid every continued fever which did not respond to quinin, and for which no adequate cause could be discovered.

With the exact means of diagnosis which are at our disposal at the present time there is no occasion for failure to differentiate malaria, typhoid, and the conditions with temperatures due to occult pus.

The nervous phenomena of typhoid, when particularly pronounced, may, upon inspection alone, closely simulate those of meningitis. In typhoid the respirations, if slow, are regular and of even depth; the pulse is slow and regular. In meningitis irregularity or some atypical condition characterizes the pulse; it may be very rapid,—180 to 200,—with a temperature of 101° or 102° F. The spleen is not enlarged in meningitis, nor are rose spots present.

Acute miliary tuberculosis may simulate typhoid. In tuberculosis

of this form there is absence of all signs excepting the fever, which is usually very high in children of the typhoid age. The enlarged spleen, the eruption, and the mental dulness of typhoid are not seen in acute miliary tuberculosis.

Mortality.—Many of the mortality tables are valueless. Statistics of cases and diagnoses antedating the Gruber-Widal reaction and the discovery of the bacillus in the blood, urine, and feces are inaccurate. Thus, in one series, in infants under one year of age, we find the mortality given as 50 per cent.

The mortality in private cases treated in homes or private institutions ranges from 2 to 3 per cent. In cases treated in hospital wards or in institutional homes it ranges from 8 to 10 per cent.

In 95 hospital cases Koplik lost 9 patients—a mortality of 9.4 per cent. Henoch, in 375 cases, had a mortality of 14 per cent.

Treatment.—While usually the disease runs a shorter course in the child than in the adult, an attack means, at the least, several days of illness, and it may mean from three to six weeks. For this reason it is best to establish a sick-room régime, under which must be particularly considered the feeding, the bathing, the airing of the room, and the maintenance of absolute quiet for the patient. The bed-linen should be changed every day, and if the patient becomes very ill, but one attendant at a time should be in the sick-room.

Bathing.—The typhoid patient should be sponged twice a day, an ordinary cleansing bath being given. During the bath, it is not necessary to uncover the body. Parts may be bathed and dried, after which other parts may be given attention.

Mouth Toilet.—Careful mouth toilet should be observed. Gingivitis and ulcerative stomatitis, with secondary involvement of the cervical lymph-nodes, are not infrequent complications of these cases.

Care of the Discharges.—The discharges from both bladder and intestine should be received in vessels containing a 1 : 1000 solution of bichlorid of mercury. Carbolic acid should not be used. The necessity for the attendants to wash their hands with soap and water after attending to the patient should be made very plain. Attendants should also be advised as to the proper disposal of the discharges. In children of tender age who still require the napkin it is best to dispense with the usual article and use cheese-cloth instead, several thicknesses of which may be made of the required shape and burned when soiled.

The Feeding of Typhoid Fever Cases.—Contrary to the general practice, I give little or no milk in typhoid cases. Early in my professional work I gave milk, which I had been taught afforded the only diet for the typhoid patient. I soon discovered that the less the milk given, the less was the tympanites. I found that without milk the temperature course was lower, that there was less tendency to delirium, that the duration of the case was shorter and, as a whole, less severe. In fact, my observations bear out the teaching of Seibert, of New York, who was the first to advocate the non-milk diet in typhoid fever.

The diet which I now use consists largely of gruels, made from

cracked wheat, barley, rice, oatmeal, or any of the uncooked cereals. I order one ounce of the cereal boiled for three hours in one pint of water. At the completion of the boiling, boiled water is added to make the quantity of the gruel one pint. If the gruel is too thick for drinking, more boiled water may be added. The gruel thus prepared is used as a "stock." It may be given plain, with salt or with sugar, or both. I frequently add, as flavoring, two or three ounces of chicken or mutton broth. From six to eight ounces of the gruel are given every three hours —five or six feedings in the twenty-four hours. The patient is encouraged to drink water, which is given between feedings. Lemonade, tea, and weak coffee may also be given between the feedings. In the event of abdominal distention under the carbohydrate diet, the gruel is dextrinized by the addition of "Cereo," one teaspoonful to a pint of gruel. The gruel should be at a temperature below 120° F. when the "Cereo" is added. Rice or other light cereal, which has been boiled for at least four hours, is given once or twice daily. It is best served with plenty of butter and sugar.

The diet schedule for a typhoid patient, aged five years, would be practically as follows:

6 A. M.: Eight ounces of gruel with sugar or a small amount of broth added. Zwieback or dried bread and butter.

8 A. M.: A drink of weak tea with sugar, or the whites of one or two eggs with sugar in orange-juice.

10 A. M.: Farina, cream of wheat, rice, served with butter and sugar, or maple-syrup and butter. Drink of weak tea or kumyss or matzoon, or perhaps a dried milk food, such as malted milk or Nestlè's food.

2 P. M.: Eight ounces of kumyss, matzoon, or skimmed milk diluted with gruel. Zwieback or dried bread and butter if wanted.

4 P. M.: Orange-egg-sherbet, or a drink of lemonade or tea and sugar.

6 P. M.: Cereal (or gruel) with sugar and butter or with broth. If skimmed milk has not been given at 2 P. M., it may be given with cereal at this time.

10 P. M.: Gruel with sugar or broth, or with wine.

Later, when the tongue becomes clear and the breath loses its characteristic odor, scraped rare beef and soft-boiled eggs may be allowed. With the use of the more substantial foods, the number of feedings in the twenty-four hours is to be reduced to four.

It will be seen that the caloric requirements, 60 to 70 per kilo, for the five-year-old child, may easily be supplied by the above arrangements of the feeding, although the diet arranged may not be an ideally balanced one. It would be high in carbohydrates, rather low in fat, and perhaps deficient in proteid, particularly during the earlier period of the treatment.

Fat in considerable quantity is poorly digested by young typhoid-fever patients. It may be given, however, in small amounts when

mixed with other foods. Foods containing proteid should not be given in considerable amount until we can predict the course of the disease. Milk, scraped beef, and soft-boiled eggs are not well borne by young typhoid patients, and a temporary reduction of proteid is not felt by them.

Carbohydrates, such as the cereals and the different sugars, are readily cared for when properly prepared and administered. They supply fuel, but no by-products, and do not require immediate elimination from the body. Excessive emaciation is prevented through their action as proteid sparers. Mendel and Rose, in the *Journal of Biological Chemistry*, state that they found that the excretion of creatin induced by starvation is inhibited in rabbits by feeding a diet of carbohydrates, absolutely free from proteids and fats. When the carbohydrates are given in liberal amounts, the creatin entirely disappears from the urine. The creatin eliminated is not reduced by feeding a diet of fat alone or by a diet of fat and proteid. Experimental interference with carbohydrate metabolism leads to the elimination of creatin, the presence of the creatin being due to a true tissue, or endogenous metabolism.

Milk should not be given in any considerable amount before the temperature has been normal for one week. Even then, in a case in which no milk has been given and in which there have been pronounced elevation of temperature and intestinal disturbance, the giving of milk may cause a rise in the temperature. In not a few cases in which the temperature was running a low course—from 100° to 102° F.—without the presence of tympanites or delirium, I have seen it shoot up to 105.5° F. and the tongue become furred and the abdomen distended as a result of the administration of milk (which has usually been given at the solicitation of friends, who feared the patient was being starved!).

Illustrative Case.—A few years ago a girl, twelve years of age, had typhoid fever. The temperature was not high, the range being from 101° to 103° F. In fact, fever and an enlarged spleen were the only signs of the disease, until the diagnosis was confirmed by a positive Widal reaction. The tongue was moist throughout the illness, as is not unusual when milk is not given. The family were fearful that the patient was not being sufficiently nourished. The mother had been told by a physician, a family friend, that such was the case. She begged that I allow the girl one glass, eight ounces, of full milk daily. I immediately ordered the nurse to give the patient one glass of Walker-Gordon milk once in twenty-four hours. She did so, and in three hours after the first glass there was a rise in temperature to 106° F., with abdominal pain and distention. One bottle of the citrate of magnesia and a high enema were given, after which the disease resumed its usual course under the previous diet, without milk, the temperature not going above 99° F. after the seventeenth day. An uneventful convalescence followed.

Mortality statistics do not teach us all that may be learned regarding the disease or a method of treatment. The time element, as related to the duration of the illness and the duration of the convalescence, is important. My observation in the milk-fed cases is that the illness is more severe, increasing the danger to life, and that the duration of the illness is longer. Emaciation is much greater, and the convalescence is consequently much more protracted than under the feeding I have

indicated. The case in which the temperature period is cut down to fourteen to twenty days, and in which there is little emaciation and a prompt convalescence, should not be put in the same class with the case in which the fever lasts from thirty to fifty days or longer, with a convalescence of three or four months, although both patients have had typhoid fever and both have recovered.

It is argued that milk constitutes the ideal diet, for the reason that it contains all the nutritional elements required by the organism,—fat, proteid, carbohydrate, and mineral salts,—which is the truth. It is further claimed that milk may be taken in large quantities and be readily digested, which is not true in the case of sick children. The addition of pepsin, hydrochloric acid, etc., has been of no value. I have learned that in order to have a short case and a mild case the abdomen must be kept flat. Tympanites is an indication of danger, regardless of how it is produced. On the milk diet, tympanites is the rule. On the mixed diet suggested it is the exception. So long as I can keep the belly flat I know I have the case reasonably in hand.

Drugs.—With the so-called intestinal antiseptics in typhoid fever, my experience has been most unsatisfactory, so far as concerns their influence upon the disease. If there is constipation, the citrate of magnesia, from four to six ounces, given cold, is grateful to the patient and usually proves effective. If the bowels do not move once in twenty-four hours, a high enema should be given. The digestive capacity is indicated by the condition of the tongue and may be improved by the use of dilute hydrochloric acid and the tincture of nux vomica. The following will be suitable for a child from five to ten years of age:

℞ Tincturæ nucis vomicæ . . . . . gtt. xlviij
Acidi hydrochlorici diluti . . . . . gtt. cxx
Glycerini . . . . . ℥iss
Aquæ destillatæ . . . . . q. s. ad ℥iv
M. Sig.—One teaspoonful in water after each meal.

As many as four bowel passages in twenty-four hours may occur without harm to the patient. In fact, I consider from two to four necessary to maintain free drainage. When there are more than six in twenty-four hours, loose and watery in character, the loss of fluids sustained may be a serious factor in the case, in causing a concentration of the blood, with a corresponding concentration of the poison, as shown in the marked general toxemia.

Diarrhea in typhoid is best controlled by the use of opium combined with bismuth. To a child from three to five years of age, the following may be given:

℞ Pulv. ipecacuanhæ et opii . . . . . gr. x
Bismuthi subnitratis (Squibb) . . . . . gr. c
M. Div. et ft. chart. no. x.
Sig.—One every three hours until the stools diminish in frequency, then give at intervals of six to twelve hours if necessary.

For children from one to three years old the dose of the Dover's powder should be reduced one-half, the full amount of the bismuth being

given. The amount required to keep the diarrhea under control will soon be learned. Of course, constipation must not be produced, for if a free bowel action is interfered with, there will be increased prostration and higher temperature.

Control of the Fever.—A temperature at or below 104° F. is not interfered with, in the great majority of cases. Of course, a very delicate child with a weakened heart action may require the use of antipyretic measures before this temperature is reached. This necessity, however, is unusual. My observation is that when the temperature is above 104° F., the patient does better if proper means are used for its control.

Antipyretic drugs are rarely given. Quinin, in my cases, has never proved of the slightest value, even when given in large doses—15 or 20 grains in twenty-four hours to a child five years of age. The coal-tar products, such as phenacetin, may be used in small doses without harm, if hydrotherapy is not applicable, as in a case which I recently saw in a remote country district.

Illustrative Case.—The patient was a boy six years of age. He was delirious at times, tossing almost constantly about the bed, and sleeping but little, with a temperature ranging from 105° to 106° F. The disease period was the latter part of the second week, and the patient was becoming rapidly exhausted. The parents, densely ignorant, refused to allow the bath or pack. Sponging, which was carried out indifferently, had not the slightest effect on the temperature and appeared to excite the patient. It was suggested to the attending physician that he give two grains of phenacetin and one-half grain of the citrate of caffein at intervals of three to six hours. From four to six powders daily were required to keep the fever within the desired bounds and the skin moist. This medicine had a decidedly quieting effect upon the patient, whose heart action was in no way unfavorably influenced and who made a complete recovery. Had the great restlessness, the loss of sleep, and the delirium continued I have no doubt there would have been a fatal termination.

While there is much truth in what has been written concerning the depressing effects of the coal-tar products, and while the dangers from their excessive use are realized, on certain occasions they are a necessity. I cannot help feeling that the dangers have been exaggerated. Probably the diseases in which the use of such drugs is most dangerous are pneumonia and the inflammatory conditions of the heart.

Heart Stimulants.—If the heart, by the rapidity of its action, shows signs of failure, the tincture of strophanthus is our best remedy. When there is irregularity in force and rhythm, strychnin should be used. A child from five to ten years of age may be given two drops of the tincture of strophanthus at intervals of two to four hours. Strychnin, $\frac{1}{150}$ grain, at intervals of three to four hours, may be given for the same age. Alcohol should not be given as a heart stimulant until other means have failed. It is a drug to be used only in conditions of great stress. Its function is to carry us over and out of difficult places, and it may be given in the form of whisky or brandy, one to three drams at intervals of two to four hours in children from three to ten years of age. Its continued administration for a considerable period is not to be advised. In any disease it is difficult to lay down definite rules for the administration of heart stimulants. They are used with the hope of producing

a definite effect, and when such effects are produced, a larger quantity should not be given. It is best always to begin with small doses and gradually increase until the desired results are apparent.

Hydrotherapy.—Pyrexia is best controlled by hydrotherapy.

Sponging with lukewarm or cool water may be tried, and if the case is not severe, this may answer. The child may be sponged with water at from 80° to 70° F. for one-half hour out of every two or three hours. Sponging, however, even if it controls the temperature, may not be the best means of using water for this purpose, for the reason that many children object to it, and in consequence the sponging disturbs them, increasing their irritability and reducing their vitality.

The use of the bath for the reduction of fever in children I have discontinued. They invariably object to it, the bath excites or frightens them, and, as a rule, particularly in the very young and delicate, the reaction following it is poor. Moreover, the bath necessitates a great deal of handling, undressing and dressing, and therefore tires the patient.

Reduction of the temperature by means of a rectal irrigation with cool water has its advocates. If the temperature is running high and intestinal lavage is indicated for reasons other than the temperature, lavage may be used here, the water being of a lower temperature than that of the body, though I never use it lower than 80° F. for this purpose. Without a high body-temperature, however, and other indications as well, irrigation is never to be used. It causes straining, excites the child, and thus increases the danger of hemorrhage and perforation. Furthermore, it is a very indifferent antipyretic, even when used with water as cold as 75° F.

By far the best means of reducing the temperature in children is the cool pack (p. 747). Its advantages are that it causes no fright or shock, the child being disturbed comparatively little by it. He may be placed in a towel, which has been wet with water at 95° F., and the only manipulation necessary is to turn him from side to side, so that the towel may be kept constantly wet with cool water at the desired temperature. The pack more effectually controls the temperature than does either sponging or the tub-bath. As suggested elsewhere (see p. 748), the child should be removed from the pack when his temperature falls to 102° F.

Hemorrhage and Perforation.—Hemorrhage has not occurred in any of my cases in which the non-milk diet was given. In the event of hemorrhage the cold coil or the ice-bag should be applied and Dover's powder given in full doses to control peristalsis. In case of perforation, operative procedure is to be resorted to, but this holds out little hope. Children bear abdominal operations badly, and, considering the exhausted condition of a young child in the third or fourth week of a severe typhoid, the outlook is most unfavorable.

MALARIA

Malaria is caused by the Plasmodium malariæ, a protozoön discovered by Laveran in 1881.

Species.—Three species of plasmodium are recognized, that causing tertian malarial fever, that causing quartan malarial fever, and that causing malaria of the estivo-autumnal type.

The tertian malarial parasite, which is the most common form, completes its development in the blood in forty-eight hours, and produces a malarial paroxysm every second day. When fully grown, the tertian parasite is much larger than the quartan variety, which sporulates in seventy-two hours. The estivo-autumnal parasite produces the remittent form of malarial fever, with varying intervals between the paroxysms. The characteristic form of this plasmodium is the pigmented crescent.

The plasmodia of malaria enter the red blood-cells and live at their expense. The resulting anemia is due to the destruction of the large number of erythrocytes, the parasites deriving their pigment from the hemoglobin of the red corpuscles upon which they have fed.

Transmission.—Malaria is transmitted from one human subject to another by the bite of the Anopheles, a species of mosquito.

The fully developed parasites are most readily found in the blood an hour or two before the onset of the paroxysm.

Craig states that in malarial localities children suffer much more severely from the disease than do adults, and that malaria is often latent in young subjects. The disease may occur in very young infants, but is always of postnatal origin. Thayer and others have shown conclusively that malarial parasites are not transmitted through the placental circulation.

Malarial fever contracted in New York city is of very unusual occurrence. Patients coming under my observation have, with few exceptions, resided elsewhere, or contracted the disease while in the country during the summer. Every autumn a few cases of such origin are treated. They are usually of the tertian type.

Pathology.—The most marked pathologic changes in malaria are found in the blood, since the plasmodia feed upon the red blood-corpuscles. As a result, there is a marked reduction in the number of erythrocytes and in the amount of hemoglobin; there is, further, the production of a large amount of black and brownish yellow pigment. The leukocytes are also decreased in number, while there is a relative increase of large mononuclear cells.

At autopsy upon patients dying of pernicious malaria characteristic lesions are found in the brain, spleen, and liver. The brain usually shows congestion and capillary hemorrhages due to blocking and rupture of the capillaries by plasmodia and pigment. There may be pigmentation of the gray matter. The capillaries contain infected blood-corpuscles, free plasmodia, free pigment, macrophages often large enough to block the vessel, and pigmented leukocytes. The nerve-cells show marked degenerative changes.

The liver is enlarged, fatty, pigmented, and congested. In the capillaries malarial plasmodia and pigment are seen within macrophages, but only very few plasmodia are found within red blood-cells. The

liver-cells are degenerated, and sometimes pressed out of existence by the distended capillaries. Areas of focal necrosis occur with an increase in the connective tissue around them.

The spleen is enlarged and pigmented, and the pulp is soft and dark colored. The venous sinuses are congested, and there are many plasmodia free in red blood-cells, in macrophages, and in smaller cells; there is also free pigment. The splenic connective tissue is increased only in those cases in which repeated attacks of malaria have occurred.

The other viscera do not show specific lesions of any kind. All the capillaries contain malarial plasmodia, and there is present more or less pigmentation. The epithelial cells of the kidneys and adrenals are usually degenerated as the result of the toxemia. The heart may be flabby and anemic. The lungs may show congestion, edema, or bronchopneumonia.

Symptoms.—The symptoms vary somewhat with the age of the patient; thus an infant, instead of giving evidence of a chill, which signals the onset in older children, becomes cold, blue, and pinched in appearance. Vomiting or convulsions may take the place of a chill. Whatever the nature of the immediate onset, fever follows, which rarely continues longer than five or six hours. This stage may not be followed by sweating. About the same time, on the following day or the day after, the same phenomenon is repeated. The patient is very comfortable between the seizures.

Physical Examination.—Physical examination of the patient will reveal enlargement of the spleen, a condition almost invariably present in malaria in children. In neglected cases signs of malnutrition rapidly develop regardless of the age. They differ in no way, however, from those dependent upon febrile conditions due to other causes.

Relapse.—When relapse occurs, it means one of two conditions—reinfection, or a case not cured. A relapse after weeks or months is not uncommon. In my observation, in cases which have been treated with quinin for only a week or two, until the active symptoms subside, after a certain time, another sharp attack results. The manifestations are occasionally milder. There is, perhaps, a low periodic temperature without chill, the temperature not reaching a point above 101° or 102° F. I have time and again had this feature of the disease brought to my attention. These cases represent what is sometimes designated as chronic malarial poisoning or persistent malarial infection. In non-malarial sections reinfection is an improbability.

Diagnosis.—The positive diagnosis of malaria depends upon finding the malarial organism in the blood, provided, of course, that quinin has not been previously given.

The next best means of diagnosis consists in the use, in suspicious cases, of adequate doses of an assimilable preparation of quinin. An immediate control of the temperature is strong presumptive evidence that malaria has existed. When full doses of quinin do not control the temperature, this fact usually means that malaria does not exist and that there are other causes for the illness.

Differential Diagnosis.—There are probably very few diseases with fever which have not many times been confused with malaria. In fact, the erroneous diagnosis of malaria has probably been made more often than all other diagnostic errors combined.

There are many conditions in which there may be a remittent temperature period, and which may be looked upon as malaria; an enumeration is unnecessary. Probably elevation of temperature due to occult pus is responsible for more diagnoses of malaria than is any other agency. Influenza, typhoid fever, tuberculosis, and periodic fever due to fatigue often have the diagnosis of malaria attached to the ailment. With blood examinations and the various newer diagnostic methods there is no occasion for errors in differentiation.

Prophylaxis.—The prophylaxis consists entirely in keeping the child free from the anopheles mosquito.

Treatment.—When it is demonstrated that malaria exists, quinin should be given in what may be considered large doses, if we are to use the adult for comparison. Children tolerate quinin well; in fact, to be effective, a much larger amount comparatively is required than in adults. In giving quinin to young children care must be used in its administration lest it excite vomiting. For this reason it should be given after meals in solution or in capsule. The best menstruum is a preparation of yerba santa, known as Yerberzine.* A child under eighteen months of age will require from 8 to 12 grains of quinin daily. Two to three grains of the bisulphate should be given at a dose, not more than four doses being given in twenty-four hours.

When I was resident physician at the New York Infant Asylum, then located in southern Westchester County, New York, there was a great deal of malaria among the women and children inmates. In that institution I repeatedly gave infants under four months of age 8 grains in twenty-four hours. In some cases at this age a larger quantity—10 to 12 grains—will be required. Quinin chocolate tablets are sometimes used in giving the drug to children. In using these tablets it must be remembered that the contained quinin is in the form of the tannate, and that one grain of the tannate represents about ⅓ grain of the sulphate. If sufficient quinin to be of value is given in this form, the large amount of chocolate in the tablet will surely upset the digestion. To children under one year of age with whom Yerberzine may disagree because of the sugar which it contains, the bisulphate may be given in solution in distilled water, followed by a teaspoonful of orange-juice. For older children,—from two to six years of age,—from 15 to 30 grains daily will be necessary to control the disease. To these, as to the younger children, it should be given in Yerberzine unless the child can be taught to take a capsule, when the quinin may be given in 3-grain doses at two-hour intervals until the prescribed daily amount has been taken.

The giving of a large dose of quinin a few hours preceding the expected chill does not answer well in children, as a large amount given at one time may frequently cause vomiting.

* Made by Lilly and Co.

Special Methods of Administration.—The use of quinin by inunction or by the rectum has not been satisfactory. Its use by these methods was attempted at the Infant Asylum in a great many cases where difficulty was experienced in the stomach-administration.

With but one patient, aged two years, have I been obliged to resort to hypodermic medication. The child showed the tertian parasite, and the disease resisted the internal use of quinin in large doses, but responded promptly to the muriate of quinin given hypodermatically, 7 grains being used at one injection. There was no abscess at the site of the injection, and the child was permanently cured. To be sure, the administration of quinin was continued by the mouth, but the dosage of 16 grains daily was now apparently effective, where previously it had made no impression.

Recurrence.—The use of quinin in malaria should not be stopped abruptly upon a cessation of the fever. It is my custom to give the drug in full doses for one week after the temperature fails to rise unless there is a subnormal temperature, in which event the drug is reduced one-half or temporarily discontinued. It is a difficult matter to determine when a case of malaria is cured. Time and again I have supposed that a patient was well when a recurrence of the paroxysm took place weeks afterward. How often this was due to reinfection, and how often to the old infection which had not been entirely eradicated, it is difficult to say. I am inclined to the belief, however, that in many instances the plasmodium had remained inactive in the spleen in spite of the return of that organ to nearly its normal size, for the reason that the recurrence of symptoms sometimes took place coincident with some other illness with fever, such as tonsillitis or acute indigestion. My experience with recurrences of the disease has been such that, after an attack of malaria, I now direct that the child be given quinin for one week out of each month, for an indefinite time—at least for a year following the original attack.

Illustrative Case.—In a comparatively recent case, a girl five years of age had repeated attacks for two years before coming under my care. The mother was instructed to give the child 12 grains of the bisulphate daily for seven days out of each month. This, without a change of residence, was sufficient to prevent a recurrence during the fifteen months which followed.

INFLUENZA

Influenza is an acute infectious disease due to the Bacillus influenzæ, first described by Pfeiffer as a result of his studies during the great pandemic of 1889–90.

Bacteriologic Etiology.—It is a slender, non-motile rod, which stains deeply at the poles, does not retain the Gram's stain, and is very pleomorphic. Its one unvarying characteristic is its utter inability to grow in media which do not contain hemoglobin. On agar mixed with human, pigeon's, or rabbit's blood, its cultivation is an easy matter. The colonies are small and dew-drop like, they do not coalesce, and they do not cause hemolysis in the surrounding medium.

Mode of Entrance.—It is the rule for the influenza bacillus to enter the human body through the upper respiratory tract, whence it may travel down into the lung, causing bronchitis or bronchopneumonia. In comparatively few cases it is the cause of otitis media. General blood invasion with Bacillus influenzæ is a rare condition, which is usually, but not invariably, accompanied by purulent inflammation of one or more serous membranes—meningitis, pleuritis, pericarditis, peritonitis, arthritis.

Source of Infection.—The source of infection is contact with an acute case of influenza or with a carrier. In either instance the secretions from the nose or bronchi contain the bacilli in a moist state. The organisms do not resist drying long enough to make clothes or linen a probable source of contagion, but they do remain viable for months in the bronchial secretion of cases of influenzal bronchitis, with or without bronchiectasis, and they have been found there six months after an attack of pertussis (Davis).

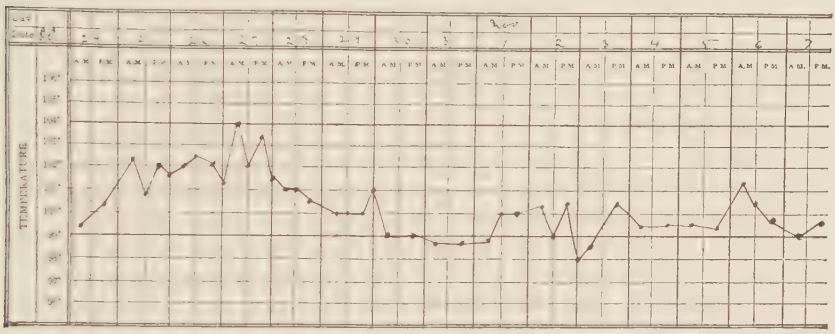


Fig. 94.—Temperature chart. Prolonged influenzal infection. Section I.

The work at the New York Babies' Hospital (Wollstein) has shown that the influenza bacillus is present in the bronchial secretion of young children far more often than is usually known, and that it is not present as a saprophyte. Patients suffering from tuberculosis are very prone to infection with the influenza bacillus. It may, in such cases, by causing a terminal bronchopneumonia, be the actual cause of death.

Age.—All ages are susceptible, particularly infants under one year.

Pathology.—Influenza supplies no distinct lesion of its own. In the respiratory tract, where the bacillus is most active, there are only the changes characteristic of bronchitis. The bacillus is most fertile in its power of producing lesions in various organs, but these lesions in no sense differ from those produced by other forms of infection.

Incubation.—The period of incubation may be very short. It is rarely longer than seven days, and may be but one or two.

Symptoms.—The onset of influenza is usually with sneezing, slight conjunctivitis, and cough. There may be a moderate fever—from 100° to 103° F. or higher. The throat is reddened, and there may be a few

coarse râles in the chest. The symptoms subside, and the child is well in five or six days. After the second year children complain of headache and muscle soreness; there is also a failure of appetite. This represents a mild attack of the type seen in a great majority of the cases.

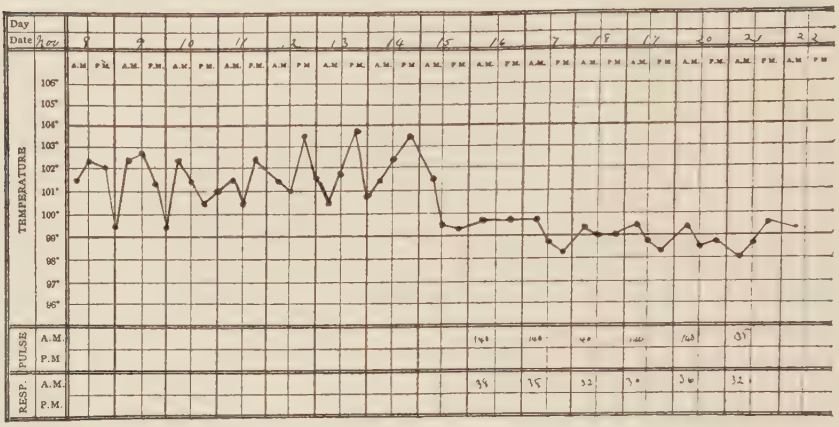


Fig. 95.—Prolonged influenzal infection.—(*Continued.*)

Severe cases show the above signs, with the exception that there are higher fever and much greater prostration. Convulsions are unusual, but headache and extreme restlessness are often present.

Cough.—The cough in the severe type is often most troublesome.

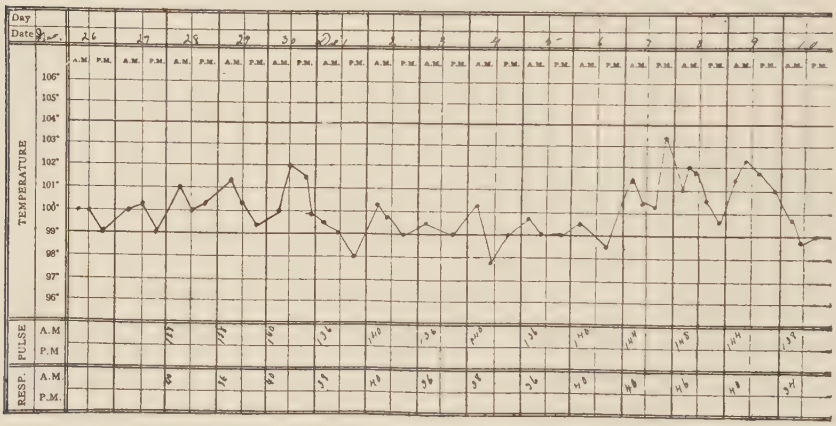


Fig. 96.—Prolonged influenzal infection.—(*Continued.*)

The most severe coughs do not occur, necessarily, when bronchitis is a complication. The hard, persistent cough, without expectoration, without râles, or with but a few râles in the chest, may be said to typify the cough of influenza. Every year I see patient after patient who has

the nagging tracheal cough not only during the attack, but sometimes for weeks afterward, without a sign in the throat other than perhaps unusual redness, and without a chest sign. The influenza bacillus seems to have a special tendency for localization in the trachea.

Gastro-intestinal Manifestations.—Occasionally grip is ushered in

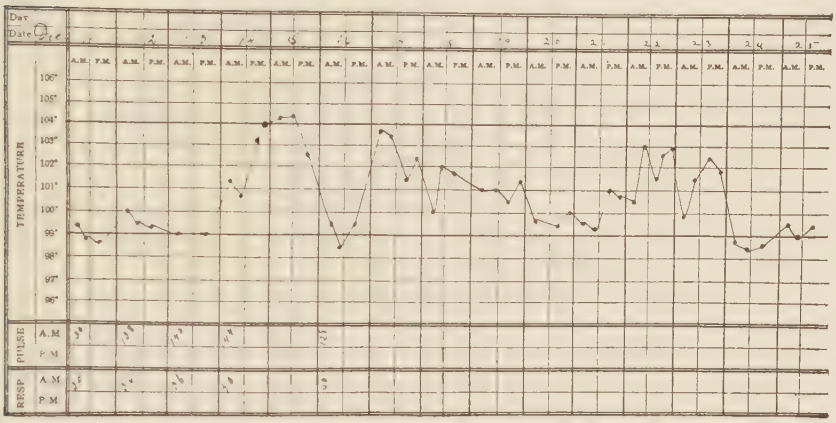


Fig. 97.—Prolonged influenzal infection.—(*Continued.*)

with pronounced gastric disturbance. There will be nausea and vomiting, no food being retained for twenty-four to forty-eight hours. Pronounced intestinal disturbance is by no means an unusual evidence of infection with the influenza bacillus; there may be diarrhea without any evidence of involvement of the intestinal structure, or there may

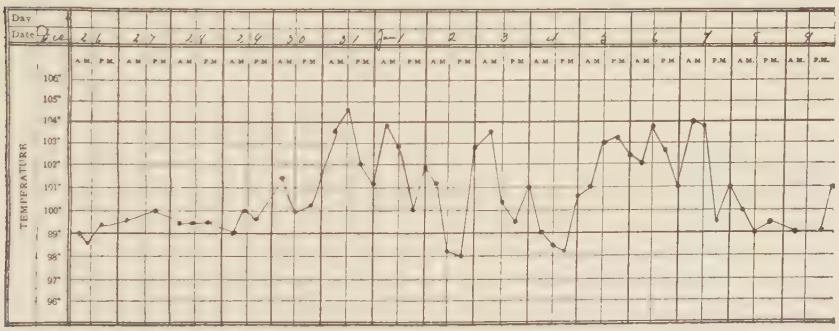


Fig. 98.—Prolonged influenzal infection.—(*Continued.*)

be colitis with tenesmus and mucus and blood in the stools. In not a few cases the so-called complications are the only manifestations of the infection. This has led writers to describe a "grip colitis," a "grip gastritis," etc.

The Temperature.—The temperature characteristics of influenza

are peculiar. There is a tendency to wide, irregular variations from normal to 105° or 106° F. and back again. I have repeatedly known the temperature to range from 100° to 103° or 104° F. for six or eight weeks (see charts), without other lesion than that of a catarrhal bronchitis. A peculiar feature of these uncomplicated grip cases is the height to which the temperature will rise daily and its long continuation for many days with insignificant signs of illness and absence of effects on the patient.

Fatal Cases.—Fatalities from uncomplicated influenza are unusual.

Illustrative Cases.—Two cases of grip in infants in which the diagnosis was made by exclusion and verified by autopsy occurred at the County Branch of the New York Infant Asylum during the winter of 1888 and 1889, which, it will be remembered, was the time when grip first visited this country in epidemic form. These healthy, breast-fed babies were taken with the disease, together with about 40 other inmates, mothers and children, in one of the large wards. The infants in question, aged three and four months respectively, were stricken suddenly with high fever and marked prostration. They quickly went into a condition of collapse, and both died in less than thirty-six hours from the onset. The autopsy failed to show any pathologic change other than a slight hypostatic congestion of the lungs.

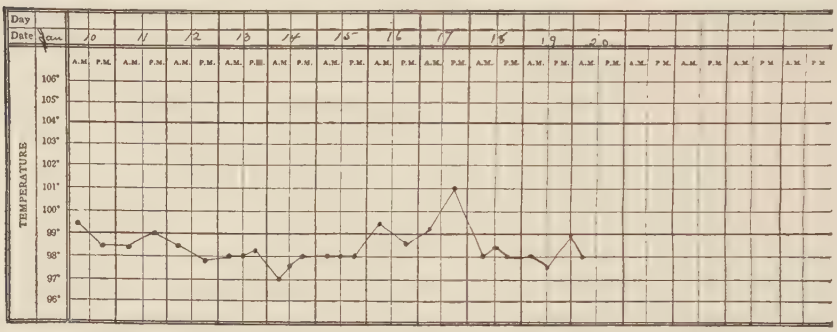


Fig. 99.—Prolonged influenzal infection.—(*Continued.*)

Complications.—The influenza bacillus alone may produce otitis, meningitis, pericarditis, peri-arthritis, peritonitis, and nephritis of the hemorrhagic type. The chief danger attending its invasion of the body is its ability to prepare a field for the development of other pathogenic organisms.

The most frequent complication of grip is *bronchitis*, and the most fatal complication is *bronchopneumonia*.

Suppurative otitis is not an infrequent complication; perhaps it would be better to class it as a grip sequela. Among 72 cases of acute suppurative otitis referred to elsewhere, 59, or 81.9 per cent., occurred with or followed immediately upon an attack of grip. Patients who, after an attack of grip, run a temperature without any apparent cause, should be examined by a skilled otologist.

Adenitis is a complication in many cases. I have seen cases of endocarditis associated with grip.

The Kidneys.—In nearly all cases of severe infection a slight amount

of albumin will be present in the urine during the entire period, and occasionally, in a few cases, hyaline and granular casts will be found. The irritation is only of temporary duration, and subsides after a few days.

In a very large experience with all types of influenza I have never known the association of acute parenchymatous nephritis with grip, such as occurs with scarlet fever or the other exanthemata.

During the past three years I have seen 9 cases of acute hemorrhagic nephritis complicating influenza. These cases were peculiar in that there was a large amount of blood with few hyaline and epithelial casts. There was little or no suppression of the urine and no edema or sign of nephritis excepting the urinary findings. All the cases recovered, although microscopic blood and casts were present in the urine for several weeks.

Duration.—The duration may be two or three days, or it may be two or three months. One attack of the disease confers no immunity. The long-continued cases are those of reinfection and recrudescence.

Prognosis.—The prognosis of influenza is favorable in the absence of complications. With complications the outcome depends upon the nature of the associated disease. Further, it is to be remembered that, as a complication of bronchitis and pneumonia, influenza supplies a decided additional danger.

Diagnosis.—From simple internal colds a differentiation may be impossible without a bacteriologic examination. In influenza there is a tendency to chronicity and reinfection, with widely fluctuating temperature, irregular as to rise and fall. It seems most difficult for the patient completely to recover. Meningitis, malaria, and typhoid fever may be confused with grip, but may be readily differentiated by the well-known diagnostic methods. In any case of influenza the ears should be subjected to daily examination, as otitis may cause an elevation of temperature identical with that of a protracted case of uncomplicated influenza.

Sequelæ.—After even a moderately severe attack of grip the patient is left in a condition that is peculiar to this disease and none other. He is habitually tired, easily fatigued upon slight exertion, shows but little tendency to take up active play, and, if older, finds school work very difficult. In a large proportion of cases there will be a slight elevation of temperature nearly every day—rarely higher than 101° F. A feature of these temperature cases is that the attack may not have been at all severe. Every winter and spring I am repeatedly consulted about the tendency to elevation of temperature after grip. In some cases the temperature will continue for months. It will be normal—98.5° to 99° F.—in the morning, perhaps 100° F. or thereabouts at noon, and 101° or 101° F. and a fraction at night. It rarely reaches 102° F. The persistent temperature cases are not due to disease processes or to the presence of the influenza bacillus in the bronchial tract, as has been claimed, but to constitutional weakness and fatigue. In some way, through the action of the toxins of the disease, the heat-regulating center becomes

involved, and through activities which ordinarily would not produce any effect an influence is exerted causing an elevation of the temperature. That a portion of this deduction is correct may be readily proved by keeping these patients quiet in bed for three days, and taking their temperature at the usual intervals, morning, noon, and night (6 P. M.). It will be found, if they are kept quiet and the bowels active, that the temperature will remain within the normal limits—not above 99° F. I have demonstrated this in a great many cases. If it continues uninfluenced, there is a discernible cause which should be discovered. After grip, because of the child's low physical state, he is often urged to take more food than he can assimilate, and there may be a mild degree of intestinal indigestion, producing sufficient toxic effects to cause the temperature, yet unobserved because of the absence of active symptoms. I have known the free use of milk and cream to produce a slight persistent elevation of the temperature after grip. Tuberculosis of the bronchial glands may produce a similar but not persistent temperature range.

Quarantine.—Individuals with influenza should be quarantined (p. 629) from other members of the household. Older members of the household are often the bacillus carriers and infect the younger members.

One attack of grip confers no immunity upon the patient; in fact, patients apparently reinfect themselves. For this reason I always advise that two rooms be used, when possible, one for the day and one for the night, the room not occupied during the day being aired for several hours with all the windows open. After recovery, the sick-rooms should be thoroughly aired, cleaned, and fumigated with sulphur, formaldehyd, or chlorin gas.

Treatment.—The individual treatment is symptomatic. The rhinitis and bronchitis are treated as if the condition were not grip.

The management of an otitis, pneumonia, bronchitis, or colitis associated with or following an attack of influenza, differs in no way, so far as the immediate treatment of the complication is concerned, from that which would be advised if the case were independent of the influenza bacillus. The case, as a whole, however, will require closer watching, and on account of the greater prostration, better feeding and freer stimulation.

The hard, dry, teasing, tracheal cough associated with and following many cases of influenza, is sufficiently troublesome to require special mention. In this condition codein should be used in sufficient dosage partially to control the cough. The cough is difficult to relieve for the reason that the mucous membrane of the trachea is deeply congested. The infection, aided by the persistent cough, keeps up and adds to the congestion; and the irritation thus produced again tends to a persistence of the cough. This is a condition where opium is not only justifiable, but absolutely necessary, in order that sufficient rest of the parts may be secured to allow resolution and control of the infection.

Vapor.—Charging the air with vapor, producing an artificial humid-

ity, greatly lessens the irritating effects on the mucous membrane of the ordinarily dry air of the living room, and relieves the cough.

External Treatment.—A preparation of mustard,—one part flour to two parts mustard,—suitably mixed and applied to the chest for five to fifteen minutes at bed-time, will often insure a better night than would result were the application not made.

Change of Climate.—When possible, patients who show pronounced systemic depression and who fail to regain their usual physical vigor should have the benefit of a change of climate. A change of a few weeks will ordinarily completely restore the patient to his normal health. When at home, or elsewhere, convalescent grip patients who show slow response to treatment should have their activities carefully advised; they should not be allowed to arise before 10 in the morning, should have a midday rest of two hours, and should retire between 6 and 7 o'clock.

Drugs.—Small doses of quinin, one to two grains at two- or three-hour intervals, have given better results in hastening a return to health than any other form of medication. If there are malnutrition and anemia, the measures laid down under the respective headings may be applicable to these patients.

SYPHILIS

Syphilis is an infectious, communicable disease seen with great frequency in early life in all large centers of population.

In 1905 Schaudinn and Hoffmann discovered a spirochete in syphilitic lesions. From its faint staining reaction they named the organism Spirochæta pallida, and later Treponema pallidum. It is present in syphilitic lesions on the skin and mucous membrane, and has been found in the blood, in the internal organs, in the lymph-nodes, in spermatozoa, in ova, and in cerebrospinal fluid of syphilitic patients. The tissues and organs of still-born syphilitic infants contain the spirochete, and in congenitally syphilitic children the organism is readily demonstrable in the mucous patches in the mouth, in the fissures about the mouth and anus, and in the skin lesions. The older the lesion, the less numerous are the spirochetes.

Noguchi has succeeded in obtaining pure cultures of Treponema pallidum, and by inoculating such pure stains into rabbits he has produced syphilis in these animals. There can no longer be any doubt of the etiologic relationship between Treponema pallidum and syphilis. The spirochete is mobile, varying in length and thickness, its average transverse diameter being 0.2 to 0.3 micron. It is best seen in the fresh state, with the dark field illumination. A rough but fairly reliable method of demonstrating the spirochete is to mix the material to be examined on a slide with a drop of India ink. By means of a piece of cigarette paper the mixture is easily spread evenly along the slide. Examination with the immersion lens shows the unstained spirochetes on a black background.

The disease in children is usually due to direct inheritance, although

acquired cases are occasionally encountered. We have accordingly to consider both the hereditary and the acquired types. (See p. 664.)

For convenience of description hereditary cases are discussed under two headings: *Acute hereditary or congenital* and *later or tardy syphilis.*

Acute Hereditary or Congenital Syphilis

The severity of the infection in the offspring bears a distinct relationship to the severity and recentness of the infection in the parent or parents. As in all infections, the disease may be most severe, or mild to such a degree that its existence is not recognized. A recent infection in either parent, or in both, produces the most active manifestations, many times sufficient to destroy the life of the fetus or even to preclude pregnancy. Death of the fetus, showing marked syphilis, any time before the ninth month indicates a comparatively recent infection in the parents. It is the parents in whom the disease is of long duration or who have undergone active treatment who are responsible for the tardy hereditary form.

Symptoms.—The symptoms, which are most variable, depend upon the age of the patient and the severity of the infection.

Thus the child may be born dead at term. I have repeatedly seen these infants almost denuded of skin and showing bone and extensive visceral lesions.

In other instances the child is born at term, alive, but shows syphilitic pemphigus and other lesions, and lives but a few hours. Other infants are born apparently normal and show signs of the disease before the sixth week. Symptoms are very apt to appear between the second and fourth weeks. Seventy-five per cent. of my cases have shown diagnostic signs before the fourth month. Some cases do not show signs until a later period—the sixth, seventh, or eighth month. Such cases, however, are unusual. The great majority show some active evidence of the disease before the sixth month. The first manifestation in congenital syphilis may appear at any time up to the thirtieth year (Fournier).

In infants apparently normal at birth and developing the signs early the symptoms are as follows:

(1) Restlessness.
(2) Rhinitis; hoarse voice.
(3) Enlarged liver and spleen.
(4) Rash; condylomata; mucous patches.
(5) Enlargement of epitrochlear glands.
(6) Deformities of the nails.
(7) Defective growth and malnutrition.

Restlessness is the earliest symptom of syphilis. The child sleeps poorly and is uncomfortable. This symptom is many times not appreciated by the physician and usually passes unrecognized by the parents. The restlessness is usually attributed to causes other than syphilis.

Rhinitis is a very early symptom, and one that is seldom absent. It is characterized particularly by its persistence and the profuseness of the discharge; in other respects it may not vary from an ordinary rhinitis.

In a considerable proportion of these cases there is a moderate degree of laryngitis with hoarseness. I have seen cases in which this sign was the earliest and most prominent symptom.

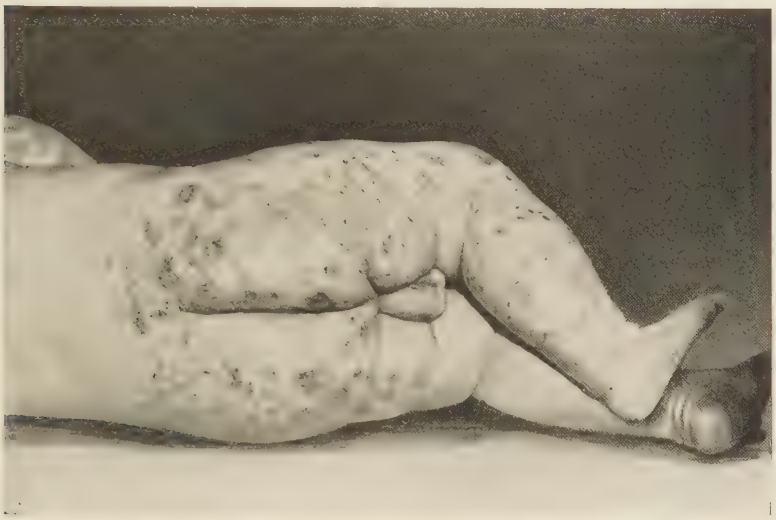


Fig. 100.—Rash in congenital syphilis.

Liver and Spleen.—An enlargement of the liver and spleen is an early sign in most cases. The spleen will be palpable below the rib for ½ to 2 inches. The liver also shows enlargement, often extending two to three inches below the free border of the rib.

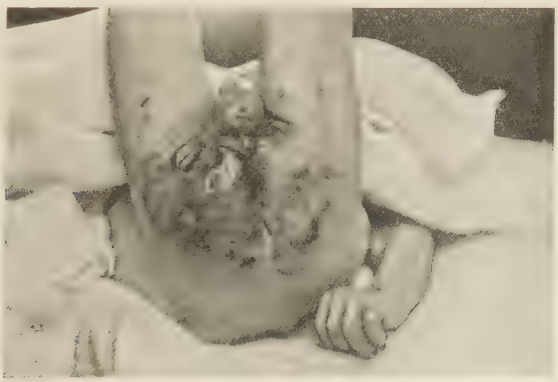


Fig. 101.—Condylomata.

The Rash.—The rash may appear very early or may be delayed for a week or longer after the rhinitis. The rash is fairly characteristic. It appears in discrete, brownish-colored macules (Fig. 100), rounded and

with a tendency to a very fine desquamation in the center. The skin between the macules may remain normal. The macules may occur in groups and become so extensive as to coalesce and involve a large part of the skin surface of the patient (Fig. 102).

Fig. 102.—Extensive syphilitic rash.

The moist parts about the buttocks, legs, and over the abdomen are usually involved first and most extensively. There is no order, however, as to the appearance of the rash, the face and the arms may be first affected, or the rash may be generally distributed over the entire skin surface. When the rash fades, the skin becomes smooth, but there is left a copper-colored stain which is as characteristic of the disease as the rash.

When the eruption occurs about the anus or the moist parts, as in flexures and skin folds, the eruption sloughs and condylomata are formed (Fig. 101).

In many cases, particularly in very young infants, a diffuse thicken-

Fig. 103.—Fissures and mucous patches.

ing of the skin of the soles of the feet and palms of the hands occurs with profuse desquamation (Fig. 104), leaving the skin of a glossy, shining

appearance. How long the skin eruption would continue untreated if the patient survived is difficult to determine. Under suitable medication the eruption largely disappears in two to four weeks, leaving the copper-colored disfigurations, which in turn fade, but require a much longer time (Fig. 102).

Fissures at the angles of the mouth and on the lip and *mucous patches* (Fig. 103) are really a part of the skin manifestations—they are characteristic in the sense that they occur only in syphilis. A mucous patch represents the site of papule or macule on a moist surface. Such lesions are usually found on the mucous membrane of the mouth. Other possible sites are the anus and the female genitals.

Acute epiphysitis occurs in young infants, but in this country it is an unusual manifestation of syphilis. There is swelling of the epiphyseal cartilages and there may be separation of the epiphysis. The parts are very painful, giving rise to the term "syphilitic pseudoparalysis."

Fig. 104.—Desquamation. Soles of feet. Congenital syphilis.

The Nails.—The nails are dwarfed, dry, and break readily. There may be exfoliation of the nail, but this is unusual in infants. A characteristic deformity is the bird-claw nail, in which the nail is much contracted, showing an arching of the dorsum of the nail with thickening, and a downward curve at the free end, over the tip of the finger or toe, producing a typical claw appearance. This is a symptom of much diagnostic value.

Hemorrhage.—Hemorrhages in congenital syphilis are rare. They may occur from any mucous surface. In a large number of cases of congenital syphilis seen in this country and on the continent there were but two in which hemorrhage was a symptom. In both these cases, strange to say, there was quite severe hemorrhage from the vagina.

Treatment.—*Mercurial Treatment.*—Until recently the only means of treating congenital syphilis in infants was by the use of mercury, locally, as by inunctions, or by internal administration, or hypodermatically. The hypodermatic use of mercurial preparations, such as

the albuminate or salicylate, is, for obvious reasons, not to be advised in young children. The use of the needle would have the effect of sending the patient to others for treatment, particularly if the case were seen in out-patient practice. The use of mercurial ointment by inunction is a satisfactory method in hospitals and in children's institutions, where a nurse can make the necessary applications; in private practice, however, it is objectionable because of the inunction itself, which may cause comment, and because of the staining of the skin. In fact, this treatment cannot well be carried on without other members of the family becoming acquainted with the nature of the illness. Definite rules for management, as regards kissing and the care of feeding utensils, should be given, so that the other members of the family may be protected and the real condition remain unknown. Among the poorer class, and in out-patient work, I have found the inunction method unsatisfactory, for the additional reason that its use is not continued sufficiently, and it is very apt to be indifferently done. It is often postponed and forgotten. As the disease permits of no temporizing, it is for the interest of the patient that the most effective means possible for its control be brought into use at the earliest possible moment; this is by the internal administration of mercury.

If the inunction is employed, the mercurial ointment, U. S. P., should be used, 10 grains being rubbed into the skin daily. The rubbing should be continued about ten minutes, as this time will be required for the ointment to be thoroughly absorbed.

The Internal Use of Mercury.—The use of mercury internally gives the best results among all classes. It is my observation, after the treatment of several hundred of these cases, that the bichlorid of mercury in small, frequently repeated doses is the best form of medication. It is given in tablet form. Its use may have to be continued for a long time, and, as people are fond of giving drugs, we cater to the weak side of human nature, and thus do the greatest good to our patient.

The Dosage and Method of Administration.—For all infants under one year of age the scheme of medication is the same, and this covers the great majority of our cases. Usually the patient is seen before the third month. I order the tablet triturate of bichlorid of mercury, $\frac{1}{200}$ grain. The mother is instructed to give two tablets daily, morning and night, after feeding. She is told to give on alternate days an additional tablet after feeding, until five are given daily, or until the mercury produces loose green stools. It is comparatively rare that an infant of the tenderest age cannot take $\frac{1}{40}$ grain daily without inconvenience. If green stools of a watery character result, the increase is temporarily withheld. It is very rare that the above amount will not ultimately be taken without inconvenience. Further, the dosage of $\frac{1}{40}$ to $\frac{1}{30}$ grain in twenty-four hours, in the great majority of the cases, is all that is necessary to control the disease. If an improvement does not take place after a week's administration, in the absence of intestinal symptoms, the amount may be increased to $\frac{1}{20}$ grain in twenty-four hours.

If, after the administration four or five times daily of the bichlorid in

the small doses of $\frac{1}{200}$ grain has been continued for several days, improvement does not take place because of failure on the part of the child to absorb the drug, inunctions may be used in addition to the internal treatment. This has been necessary, however, in but few of my cases.

Convalescence.—In a typical case the first sign that the child is improving will be the fading of the rash. It disappears gradually, leaving the characteristic staining of the skin, which also clears up in a few weeks. Coincident with the fading of the rash, the coryza becomes less pronounced and the hoarse voice becomes clearer. If there has been an enlargement of the liver and spleen, after a few weeks of treatment they will be noticed to have diminished in size. The child gains in weight, and if the case progresses satisfactorily, soon looks like a normal baby. This, however, is not always the happy outcome. Occasionally we have patients with the vital powers greatly depressed or with so intense an infection that treatment is of no avail, and they die in a few weeks from marasmus. In such cases and in all instances of very severe infection salvarsan should be given with mercury. The action of the salvarsan is very prompt and will check the progress of the disease much sooner than mercury, regardless of its method of administration.

The enlargement of the epitrochlear glands is, in my experience, the last sign to disappear, and in many cases these glands, though reduced in size, always remain enlarged without any other persistent evidence of the disease. A patient is considered cured who fails to give a positive reaction to repeated tests of the blood, according to the Wassermann method.

Later Treatment.—What should be the further management of such a so-called "cured" case? Are we justified in discharging the patient and allowing him to pass from our observation? My experience proves the contrary, nor can I state that congenital syphilis is ever cured. I have seen many patients, however, who were apparently cured, and who showed no signs whatsoever of the disease. Against my advice they have passed from observation for two, three, or four years, and then have reappeared for treatment, because of the presentation of some manifestation of a tertiary character—a so-called "tardy hereditary syphilis." For this reason I believe every so-called cured congenital case should be subjected to the Wassermann test every two years or oftener.

Salvarsan Treatment of Hereditary Syphilis.—Until recently salvarsan has generally been given intravenously either into the median basilic or cephalic veins, and by means of a specially constructed glass cannula. With experience this has been found to be unnecessary and tedious, being a surgical operation. All that is needed is a small 5 c.c. glass Luer syringe with a 22 gage needle 1.5 cm. in length.

Technic.—According to an article by Holt and Brown in "American Medicine,"* the technic advised is as follows: The patient is tightly wrapped in a sheet to secure the hands to the sides in order to prevent struggling. The child is then placed on the table with the head hyperextended over the end and turned to whatever side is desired and held in this position by an assistant. By this method introduction of the

*"American Medicine," September, 1913.

needle is readily effected into either of the auricular veins during a paroxysm of crying. The scalp veins are chosen because of the fact that they lie more superficially and are more firmly bound by connective tissue, thus facilitating the introduction of the needle. The external jugular veins may be used in a similar manner.

Dose.—The same observers state that for the younger children under six months 0.05 gm. of salvarsan or 0.075 gm. of neosalvarsan are used, and for the older ones 0.1 gm. salvarsan or 0.15 gm. neosalvarsan. The dose should be repeated every two weeks for the first three doses, then at two- or three-month intervals thereafter, at the same time estimating the progress by the Wassermann test. Local and general reactions are rare and of no consequence.

Results.—Out of the 34 cases studied by Holt and Brown at the Babies' Hospital, extending over a period of observation of one and a half years, 16 recovered and remained cured. Of these 16, 10 showed a negative Wassermann reaction when last tested and all of the 16 were in excellent condition. The immediate results were in many instances very striking. A drying of the lesions was noticed within twenty-four hours after the first treatment, while the spirochetes usually disappeared from the lesions within four to five days. The Wassermann became negative on an average of four months from the first dose, and in only two instances did it again become positive. In only one case was there a recurrence of the disease with classic symptoms.

The type of case treated may be estimated from the following facts: 19 were under three months of age, and only 5 were over one year. Fourteen patients were under 8 pounds in weight, while exactly half of the total number were suffering from a severe infection. Eleven had had previous mercurial treatment. The chief cause of death was bronchopneumonia, only 4 dying from syphilis.

Salvarsan in itself is not a complete cure, but should in every case be used in conjunction with mercury. Neosalvarsan, on account of its readiness of preparation, is preferable; its immediate effect is just as rapid as that of the old preparation, but as yet its permanent results have not been established. Several years of investigation and observation will be required before the real value of salvarsan in congenital syphilis is definitely known.

Acquired Syphilis

Acquired syphilis in children, in my observation, is a comparatively rare occurrence. The mouth is the most frequent site for the primary lesion, the genitals being rarely involved. Infection may be conveyed by direct contact, as in kissing or by sexual contact. The virus may be conveyed by intermediaries, such as toys, nipples, and feeding utensils.

The recital of statistics and special modes of infection adds nothing to our knowledge of the subject. It is necessary to remember that a localized lesion, slightly sloughing over its surface, indurated and sharply defined, may be in a child the initial lesion of syphilis.

The **treatment** is the same as that of the hereditary form.

Tardy Hereditary Syphilis

In this form of syphilis the chief or only manifestation of the disease occurs at a later period of life. Fournier states that the first signs of the disease may appear as late as the thirtieth year. That the case in which positive signs are not observed until after the third year did not show unrecognized signs early in life is an open question. Judging from my own patients, and what could be learned about their early life from intelligent mothers or attendants, I am convinced that an individual may show signs of syphilis at varying periods after infancy without early signs of the disease. Several years ago I reported six cases of tardy malnutrition of syphilitic origin in which there had been no early signs of the disease. Since that time I have seen several other cases of a similar nature.

The great majority of my patients with tardy hereditary syphilis, however, are those who were treated in out-patient clinics or elsewhere and who discontinued treatment when the active symptoms were relieved. I have had such experience with my own out-patients and have treated similar cases from other outdoor services. Many mothers cannot be made to bring their children for treatment and observation when they are apparently well.

Pathology.—1. *Eye.*—The eye changes are those of an interstitial keratitis, gummatous involvement of the iris, and the so-called deep inflammations of the eye, chorioretinitis and optic neuritis.

2. *Ear.*—Progressive deafness due to neuritis acustica (Ménière's disease).

3. *Skin.*—According to Hochsinger, the changes in the skin do not differ from the tertiary skin lesions of acquired syphilis. He described two forms, first, small nodules, and, second, large nodular late syphilids. The small nodules are due to a definite infiltration of the true skin, which presents a brownish appearance and may desquamate or become covered with a heavy crust. Beneath the crusts there is usually broken-down granular tissue. The large nodular syphilid occurs in the form of large skin gummata and gummatous ulcers arising from the subcutaneous tissues.

4. *Mucous Membrane of the Respiratory Tract.*—This structure may become invaded in a specific manner. It may be the seat of gummatous infiltrations or a rapidly progressive ulceration. Ulcerations of the pharynx and larynx are not rare. Such lesions are usually characterized by definitely defined borders and thick indurated walls. In the nose there may be a diffuse osseous and periosteal affection of the entire nasal skeleton, or a gummatous change may represent the primary pathologic process, followed by ulceration with much pus and crust formation. On the contrary, there may occur an atrophic condition of the mucous membrane. Levin and Heller describe a smooth atrophy of the base of the tongue characterized by absence of glandular tissue and thinness of the mucous membrane. Gummatous formation, as described above, may occur on the velum palati, palatine arches, and uvulæ, with perforation. All the ulcerations which take place show a great

tendency to scar formation, with corresponding contractions and adhesions to their adjacent parts.

5. *Lymph-nodes.*—A general hyperplasia of the lymphatic tissue of the pharynx and nasopharynx, including the tonsils, may take place, while in the lymph-nodes throughout the body, aside from general hyperplasia, gummatous formation is not uncommon. Occasionally the glands may undergo ulceration.

6. *Vessels.*—There may exist, according to Hochsinger, a gummatous aortitis, arteriosclerosis, and phlebosclerosis, while myocardial and endocardial changes have been observed.

7. *Viscera.*—Liver affections deserve the first rank. There may exist large nodular gummata; the diffuse hypertrophic cirrhosis is most common. These changes are almost always associated with more or less splenic hypertrophy. The kidneys may be small and contracted; amyloid degeneration is rare. Gummatous formation in the lungs may occur, but it is very uncommon.

Fig. 105.—Showing saber deformity of legs in tertiary congenital syphilis in a child nine years of age (Dr. Sill).

8. *Bones.*—Late syphilitic changes occur in the osseous system either as a diffuse hyperplastic ostitis and periostitis, or as a gummatous process; lesions of both varieties, however, may occur at the same time in the one individual. According to Lannelongue, a hyperplastic ostitis and periostitis may involve the whole skeleton. The long bones are chiefly affected. The same author considers that the so-called Paget's bone disease, which is a diffuse progressive periostitis leading to hyperostosis, is nothing more nor less than hereditary syphilis.

The tibia is the bone most frequently involved. The disease here produces what is known as the "saber deformity." (See Fig. 105.) Following the hyperplastic stage is the real stage of hyperostosis, the deformity being due to the continuous formation of new periosteal bone layers about the primary one.

Among the less frequent bone changes in late hereditary syphilis

is a rarefying periostitis leading to bone absorption. This condition is seen on the surface of the cranial bones and causes the formation of rough areas (caries sicca).

Joint affections may occur in late hereditary syphilis in the form of a simple hydrops without capsular thickening or a hyperplastic synovitis. Again there may be a combination of hydrarthrosis, with swelling of the joint-ends of the hollow bones, and in rare instances a condition resembling white swelling.

Symptoms.—This form of syphilis in the young may manifest itself in widely different ways.

Errors in Nutrition (see p. 669).—A not infrequent manifestation is that of moderate malnutrition and stunted growth. The patient is habitually pale, undersized, and shows lack of resistance, and such evidences may be the only signs of the disease.

Fig. 106.—Hutchinson teeth.

The Bones.—Characteristic signs are to be found in the bones and teeth. The shafts of the long bones are involved in a periostitis. (See Fig. 105.) The tibia when affected may show the saber deformity. The tibiæ are most frequently involved; next in frequency, the radii. Gummata may involve the flat bones of the cranium, although such an occurrence is comparatively rare. The "saddle nose" caused by a destruction of the septum is a condition not infrequently seen in congenital syphilis.

The Teeth.—Fairly characteristic signs, first described by Hutchinson, are often shown by the second set of teeth. The first set in no way give evidence of the disease. Hutchinson's teeth represent faulty development. They are variously described, according to the deformity presented, as notched, "screw-driver," and peg-shaped. (See Fig. 106.)

Lymph-nodes.—The only lymph-node involvement of significance is that of the epitrochlears. General lymph-node involvement is to be looked upon as corroborative of other signs of consequence.

The Eye.—A diffuse interstitial keratitis is one of the most frequent manifestations of tardy hereditary syphilis.

Involvement of Other Structures and Organs.—The spleen is usually enlarged, the liver not infrequently. I have seen three cases of brain tumor of syphilitic origin. As is well known, any portion of the body may be involved in a syphilitic process, and a detailed description of the various possibilities is out of place at this time. The symptoms as outlined represent the usual manifestations.

Treatment.—I have had no experience in the use of salvarsan in tardy hereditary syphilis. As in the treatment of tertiary syphilis in the adult, likewise in the treatment of the late hereditary form in children, the iodids play an important part. Much better results, however, are obtained with the so-called "mixed treatment." The iodids alone are not sufficient to give us our best results, and the results with mercury alone are not so prompt and satisfactory as when the two drugs are combined. For an average case of periostitis involving the anterior portion of the tibia in a child four years of age, from $\frac{1}{30}$ to $\frac{1}{20}$ grain of bichlorid of mercury should be given daily, combined with sufficient iodid of potash to produce the characteristic coryza. This may necessitate the giving of from 12 to 20 grains of iodid daily, as children vary greatly in their susceptibility to the drug. The mercury and the iodid of potash should not be given in one mixture, as the combination is most disagreeable to the taste. It is far better to give the bichlorid in the form of tablet triturates. The iodid of potash is best given in a saturated solution, one drop of which represents one grain of the drug. This is best taken when dropped into milk after meals. Beneficial results from the treatment will usually be apparent in a few days. If there is a periostitis, the pain will be the first symptom to disappear.

The administration of the iodid of potash should always be interrupted, chiefly because of the possibilities of deranging the child's digestion. I usually give the drug for ten days, followed by a rest of five days, when it is again resumed. Proper nutrition in these cases is a most important factor in their management. If the iodid is given to the point of tolerance, its omission for a few days will not be noticed. The mercury is given for weeks continuously in doses of from $\frac{1}{60}$ to $\frac{1}{20}$ grain three times a day, graduated according to the age. Later, when the progress of the case shows that the disease is under control, the two drugs should be given alternately, for ten days each. How long this treatment should be continued must be determined by each individual case. The Wassermann test in these cases is of much service. Patients who are apparently cured should be instructed to report to the physician every three months. I frequently advise a course of treatment for three or four weeks, two or three times a year. A sufficient excuse for such action may be the condition of the child, who may show a tendency

toward slow growth and improper nutrition. The patients should be kept under observation for years and should be seen at stated intervals until the adult period is reached, when the nature of the trouble should be explained to them. The disease from which such a child is suffering should always be made plain to parents, or at least to one of them, in order that the patient may not be allowed to pass from under medical observation in ignorance of his true condition.

Tardy Malnutrition of Syphilitic Origin.—The possible manifestations of syphilis in the young, as in the adult, are many. The infection may be so severe as to destroy the fetus, or so mild in its effects as to make recognition difficult. Not the least interesting and important of the cases showing remote manifestations are those in which late malnutrition is the *only evidence* of the syphilitic infection. The patients are usually thin, sometimes sallow, sometimes pale, with little or no adipose tissue. They are almost always undersized as regards height, always underweight; the appetite is poor, and they have but little endurance and correspondingly little resistance. Those seen by me were between three and ten years of age. None of the patients were mentally defective. When two such children are seen in a family in which both parents are robust, this circumstance is a strong indication that the children are suffering from the results of a remote syphilitic infection in one of the parents. The physical examination may show nothing definitely, and yet the Wassermann reaction prove positive.

Cases of late malnutrition, non-syphilitic in character, due to poor hygiene and faulty feeding, may present symptoms identical with the above, so that while the two conditions cannot be differentiated by the clinical signs, there may be sufficient grounds for suspicion to warrant us in questioning the father, whereupon the history of a primary sore with perhaps secondary lesions may be elicited. There may have been prolonged treatment, with a subsidence of all the symptoms, and the patient may have been pronounced cured and told that he might safely marry. Many times have I heard this story when the evidence of transmission was before me in the form of a typical case of congenital syphilis.

Treatment.—Treatment of tardy malnutrition of syphilitic origin by the supportive and restorative methods used in the cases of non-syphilitic malnutrition is without avail. (See Tardy Malnutrition, p. 92.) These patients require mercury, either alone or combined with the iodids. To the usual methods of treatment with iron, cod-liver oil, baths, and massage, there will be but little response, but if bichlorid of mercury or the iodid of potash be added, the case will improve. The improvement is slow, to be sure, but it is invariable. The child should be given the advantage of an outdoor life, with free ventilation of the sleeping-room at night. The food should be highly nutritious, containing a large amount of proteid. Eggs, meat, milk, and the high-proteid cereals, such as oatmeal, are the most valuable. The dried legumes,—peas, beans, and lentils,—given in the form of purées, are a

valuable addition to the diet. Salt baths at bed-time (p. 750) during the entire year, followed by oil inunctions during the cooler months, are valuable in restoring a vigorous condition. As these children are almost always anemic, it may be well to combine the bichlorid of mercury with nux vomica and quinin. For a child from five to ten years of age the following prescription has been used with marked benefit:

℞ Hydrargyri bichloridi . . . . . gr. ss
Tincturæ nucis vomicæ . . . . . gtt. xc
Extracti ferri pomati . . . . . gr. x
Quininæ bisulphatis . . . . . ʒj
M. Div. et ft. capsulæ no. xxx.
Sig.—One capsule after each meal.

This is given for ten days, when the bichlorid of mercury in tablet form, $\frac{1}{60}$ grain three times daily after meals, is given for ten days. During the ten days when the bichlorid is given alone maltine and cod-liver oil may be given—one dessertspoonful three times a day after meals. In these cases iodid of potash is not to be given early in the treatment, for the reason that the appetite is usually poor or indifferent, and the administration of the drug at this time might further decrease the desire for food. The iodid of iron may be used in doses of 10 to 15 drops, three times daily, if the physician desires to change the form in which the iron is administered.

Duration of Treatment.—Prolonged treatment will usually be required. These patients should be kept under close observation for at least two years, or until they arrive at adolescence, when they should be made acquainted with the nature of the disease. During the entire growing period the administration of mercury during one month out of every three, or possibly every six, depending upon the child's condition, will insure better growth and a more vigorous development both physically and mentally.

TUBERCULOSIS

Tuberculosis is the condition resulting from an invasion of the body by the tubercle bacillus.

Types of the Infection.—There are two types of the bacillus—the *human* and the *bovine*. In 132 children between the ages of five and sixteen years Park and Krumweide found the bovine type in 33 cases. In 20 of these there was a tuberculous cervical adenitis, in 7 abdominal tuberculosis, and in 3 generalized tuberculosis. Alimentary origin of generalized tuberculosis was apparent in 1, tuberculosis of the bones and joints in 1, and tuberculosis of the tonsil in 1.

Of 220 children under five years of age 59 showed the bovine type. Of these, 20 showed tuberculous cervical adenitis; 13, abdominal tuberculosis; 10, generalized tuberculosis—alimentary origin; 5, generalized tuberculosis; 8, generalized tuberculosis including meningitis—alimentary origin; 1, generalized tuberculosis including meningitis; 2, tuberculous meningitis.

The percentages of bovine infections were as follows:

	Children Five to Sixteen Years.	Children Under Five Years.
Pulmonary tuberculosis	0 per cent.	0 per cent.
Tuberculous adenitis (cervical)	37 " "	57 " "
Abdominal tuberculosis	50 " "	68 " "
Generalized tuberculosis	40 " "	26 " "
Tuberculous meningitis, with or without localized lesion	0 " "	0 " "
Tuberculosis of bones and joints	3 " "	0 " "

Park and Krumweide conclude as follows: "In children, the bovine type of tubercle bacillus causes a marked percentage of the cases of cervical adenitis leading to operation, temporary disablement, discomfort, and disfigurement. It causes a large percentage of the rarer types of alimentary tuberculosis requiring operative interference or causing the death of the child directly or as a contributing cause in other diseases.

"In young children it becomes a menace to life and causes from six and one-third to ten per cent. of the total fatalities from this disease."

The bovine infection is largely limited to children, and the fatal cases are further limited to infants and very young children.

Avenues of Entrance.—Tubercle bacilli may enter the body by means of the respiratory and alimentary tracts, by means of the genito-urinary system, and through the skin. The two latter are very unusual modes of entrance. The avenue of entrance of the bovine bacillus is the alimentary tract—that of the human type, the respiratory tract. In a large majority (60 per cent.) of my cases the patient had been in association with a tuberculous individual.

Illustrative Cases.—Two children, aged six and eight, developed pulmonary tuberculosis. They were dispensary patients, and lived in a small three-story tenement house. The fact that the two cases developed at the same time seemed conclusive evidence of a common source of infection. Both the father and the mother were well, and they, with their two children, composed the family. Upon further investigation we found that the janitor of the tenement had advanced pulmonary tuberculosis, and that he was not at all careful where he deposited tuberculous sputum.

Aged people with chronic bronchitis are often carriers of the tubercle bacillus, and such persons are the most dangerous. They remain indoors and infect the rooms. Not suspected of being tuberculous, they are careless, they kiss and fondle, and often assume considerable care of, the younger members of the family. I have traced several cases of tuberculous meningitis to such origin.

Illustrative Cases.—In a recent case the infection was traced to the grandfather whom the child visited for four weeks.

A baby of nine months, an only child, died from tuberculous meningitis. No source of the infection could be discovered until, six months later, the mother developed acute pulmonary tuberculosis of a very active type. She undoubtedly was suffering from latent tuberculosis at the time of the child's death. The father contracted the disease apparently from his wife, and died in two years. In all these cases there was a decidedly virulent infection.

Predisposing Causes.—Among the predisposing causes, age is important. The more tender the age, the greater the susceptibility. Any illness which decreases the general resistance or lessens the resistance of

the upper air-passages or lungs, predisposes to the disease. Thus we see many cases following measles, scarlet fever, influenza, and bronchopneumonia. Adenoids and diseased tonsils are eminently predisposing causes, particularly favoring tuberculous cervical adenitis. Heredity is less a factor than is generally supposed. Often what passes for heredity is a direct infection from a tuberculous parent, in whom the disease has remained dormant in the bronchial glands or elsewhere, and does not develop until a late period.

The close housing of children during the colder months is of no little importance as a means of diminishing resistance to the bacillus. The habit of frequent change of residence is also a source of infection. A family moves into an apartment or tenement with little thought or knowledge of the previous occupant, and the owner makes no effort at painting or cleaning for the new tenants, carrying out only such changes as are absolutely necessary. I have known tuberculosis to develop in children occupying an apartment in which a tuberculous adult had previously been domiciled. Infection may take place through the blood of the mother by way of the placental circulation. Cases have been reported in our country by Jacobi and Wollstein, in which a tuberculous fetus has been born to a tuberculous mother.

Prophylaxis.—The best insurance against tuberculosis is a vigorous bodily resistance. At least 85 per cent. of the human race are infected some time before the fifteenth year, but, fortunately, the great majority of those infected are able to withstand the invasion. Adenoids and diseased tonsils should be removed from every child who possesses them. Children should be allowed to make complete recoveries from bronchitis, bronchopneumonia, influenza, whooping-cough, measles, etc. A week or longer from school is a matter of no moment in the child's future from the standpoint of knowledge. Kissing of children on the mouth should be forbidden. This act is a grossly unfair advantage to take of an innocent child. Overwork at school, in mines, and in factories predisposes, by fostering close associations and diminishing resistance.

The reporting of tuberculous cases, and the rigid enforcement of hygienic measures relating to the disposal of tuberculous sputum, would materially lessen the number of cases.

Milk Infection.—The infection of the bovine type, producing glandular and abdominal tuberculosis, is preventable by pasteurizing all milk and butter which is not taken from tested cows proved free from tuberculosis.

Infection through tuberculous meat is possible, but rare.

Relative Frequency in Different Sites.—Although the tonsil is looked upon as a portal for the frequent entrance of the disease, this organ itself has been found to be tuberculous in very few instances.

In 90 per cent. of all cases of tuberculous lymphadenitis the cervical glands are involved, and chronic inflammation in these glands, when well advanced, is usually aggravated by the presence of infecting organisms of the staphylococcus or streptococcus groups.

Still has reported important findings in 216 postmortem examinations following fatalities from tuberculosis in children. In 63.8 per cent. he traces the incidence of the disease to the lung; in 29.1 per cent. to the intestine; and in 15 of the 216 cases, to the ear. By other authorities the frequency of primary respiratory infection is estimated at 65 to 70 per cent., and that of an initial intestinal infection at 15 to 30 per cent.

Both Still and Carr report finding caseation of the mediastinal glands in 81 per cent. of autopsies on tuberculous subjects, while in a proportion ranging approximately from 55 to 60 per cent. the same observers found a similar condition in the mesenteric glands. The mediastinal glands on the right side are more frequently diseased than those on the left.

Nearly 60 per cent. of tuberculous cases have shown invasion of the mesenteric glands; and in 12 of 100 autopsies upon children under two years of age, Still found tuberculous peritonitis.

Abdominal Tuberculosis (Tuberculosis of the Mesenteric Gland; Tabes Mesenterica)

Tuberculosis of the mesenteric gland is not uncommon in the findings at autopsy upon young tuberculous subjects. Rarely is the condition sufficiently developed, in this country, to be recognized clinically independent of peritonitis. My first postmortem examination upon a child, however, was in a case of this character. The patient was three months old, colored. I have examined at autopsy two other cases in which there was uncomplicated tabes mesenterica with no peritonitis. I have diagnosed the condition in three other cases as true tabes mesenterica.

Symptoms.—The symptoms include slow progressive emaciation, slight inconstant elevation of the temperature, distended abdomen, persistent intestinal indigestion, diarrhea, flatulence, and abdominal pain. The pain is colicky in character, and may be very severe and continue over a considerable period.

Diagnosis.—A positive diagnosis is to be made upon one's ability to palpate the enlarged glands. For critical abdominal examination I very often employ light anesthesia. This renders the examination far more satisfactory. The glands in my cases were best felt in the right or left iliac fossa.

The symptoms somewhat resemble those of chronic appendicitis, and a rectal examination may be necessary to determine if there is an enlargement of the appendix or adhesions or infiltration about it.

Prognosis.—The prognosis is unfavorable in cases that have developed sufficient signs for a diagnosis. Still, who has had a large experience in abdominal tuberculosis, states that we are never sure of the recovery cases. The diseased glands may at any time be the starting-point of a general or localized inflammation, with the output of extensive adhesions resulting in a general tuberculous peritonitis or producing local effects interfering seriously with the functions of the intestine.

Illustrative Case.—About four years ago I performed an autopsy for a colleague on a two-year-old child who had died suddenly with symptoms of acute intestinal obstruction. The child had had abdominal trouble during the second year, and had been seen by different physicians, one of whom made a diagnosis of tabes mesenterica. The patient improved and three months previous to the fatal termination was well, with the exception of obstinate constipation. The postmortem showed a most remarkable picture of enlarged glands matted together by fibrinous exudate, which had been poured into the abdominal cavity and had undergone connective-tissue formation. The descending colon resembled a hollow tube held in position by the surrounding exudate. How the child had lived and had bowel evacuations is difficult of explanation. The obstruction was caused by an angle forming at the point where the free intestine, filled with gas, joined the fixed portion.

Treatment.—All measures that will increase the patient's resistance should be employed. An out-of-door life and the general management advised in treating tuberculosis (p. 360) should be followed.

Still believes that operative measures are of value. He finds that removal of the enlarged glands is to be advised, as thereby eliminating a definite focus of infection. At the same time fibrinous bands causing pain and symptoms may be broken up.

CHRONIC TUBERCULOUS PERITONITIS

Acute tuberculous invasion of the peritoneum may be found in a few cases of general tuberculosis. It is of no clinical significance, and has been briefly referred to on p. 360.

Chronic tuberculous peritonitis is a comparatively infrequent disease in this country. In England and on the Continent many more cases are seen. Still, of London, reports 266 fatal cases of tuberculosis in children under twelve years of age, 45 of whom died with tuberculous peritonitis—a percentage of 16.8. Under two years of age, this author found 12 cases of tuberculous peritonitis in 100 tuberculous infants.

Etiology.—A considerable proportion of the cases are probably due to an extension from infected mesenteric glands. Through the lymph and blood-channels the bacilli may be carried to the peritoneum from any focus.

Pathology.—The course of the inflammation may be acute or chronic, and the changes produced have given rise to a classification of several types of the disease.

1. The simplest lesions consist of scattered grayish miliary tubercles unassociated with the presence of exudate or other evidences of an advanced process. This picture is seen in connection with a general miliary tuberculosis which may have presented no local clinical signs.

2. In a second form of the disease, coexisting with miliary tubercles which are scattered over the peritoneum in great number, there is a marked ascites depending on the predominance of the element of exudation. The exudate is serous and contains only a moderate amount of fibrin. When the fluid accumulation is large, the intestines are floated up and the abdominal cavity is characteristically distended.

3. A third variety of tuberculous peritonitis is predominantly adhesive and unaccompanied by the exudation of much fluid. The loops of intestines become closely matted together and the omentum is rolled up

in a firm elongated mass. The typical tubercles are present, but have, at many sites, become confluent and been transformed into larger foci, or given way to the development of reparative fibrous tissue. The amount of fluid exudate is small and may be clear or clouded by the admixture of fibrin and flakes of pus.

4. Finally, the lesions may be of a destructive character, consisting of actual ulcerations caused by the disintegration of large caseous foci. In such an event, adhesions between intestines, mesentery and omentum are produced which serve to confine collections of pus. These may eventually break forth and discharge externally. Fecal fistulæ or abscesses between adjacent portions of intestine are not uncommon.

Types of Bacilli.—Park and Krumwiede found the bovine form in 20 of 53 cases of tuberculosis between the fifth and sixteenth years. In 35 children under five years the bovine bacillus was present in 20 cases.

Types of Lesions.—The disease is usually divided pathologically into two leading forms—the *ascitic* and the *plastic* or *fibrous*.

There are few cases of the fibrous type, however, without fluid in the abdomen, and few ascitic cases in which there is not some fibrous formation. Still found the proportion of the fibrous to the ascitic type 10 to 1.

Age of Patients.—The great majority of cases occur between the first and third years. Cases developing before the end of the first year are rare.

Symptoms.—Suggestive symptoms in all cases are abdominal discomfort, pain, and distention from gas or fluid, digestive disturbances, emaciation, and persistence of all symptoms in spite of medication and careful dieting.

The Ascitic Type.—In the ascitic form, when the patient first comes under observation, the abdomen usually contains considerable fluid. This increases rapidly and the abdominal wall becomes distended and tense.

There may be a temperature of 100° to 102° F. An elevation of the temperature is, however, not invariably present: it is as often absent. There is a secondary anemia, and the child becomes emaciated and tires readily. A differentiation, however, between tuberculous ascites and that due to other causes may not be possible without corroborative evidence of tuberculosis elsewhere. Examination of the ascitic fluid even in positive cases does not always show the presence of the tubercle bacilli. Through absorption of the fluid, cases that belong to the ascitic type at first, change to the fibrous. This in my experience is not at all unusual.

The Plastic Type.—In these cases the onset is gradual, the temperature usually is not high—100° to 101° F. There are loss of appetite and emaciation. Intestinal indigestion, evidenced by tympanites and occasional diarrhea, is common. There may be constipation alternating with diarrhea, and there is almost always pain. It is the pain that usually attracts the attention of the parents to the child's condition. The

course of this form of the disease is slow and its progress may be interrupted by periods of improvement.

Diagnosis.—It is rare in cases of the fibrous type or in those due to mesenteric lymphadenitis not to find nodules in either of the iliac fossæ or the evidence of fibrous bands in the abdomen. The retracted, thickened omentum, forming a distinct ridge across the abdomen, is present in many cases. This may be confused with the lower edge of the liver. Careful palpation, however, will demonstrate the band as thick and roughened, and extending well across the abdomen in a downward direction toward the left side. A space between the band and the lower edge of the liver can usually be made out.

With the palpable mesenteric nodes or the fibrous bands, there will be fluid in some amount. An unfolding of the umbilicus, with redness about it, producing a condition known as "pointing," is a suggestive symptom. Perforation at this point is not an uncommon occurrence in the experience of those who see many cases of this disease.

Prognosis.—About one-half of the patients recover. I have seen pronounced cases make complete recoveries. It is a difficult matter, as in the instance cited (p. 674), to decide when a patient is well. The cases with ascites promise better than do those of the fibrous type; and yet many of the latter form which promise little make complete recoveries.

Illustrative Case.—A boy three years old developed a tuberculous peritonitis of a pronounced fibrous type. The omental band could be seen elevating the skin across the abdomen in a distinct ridge. After several months of treatment improvement began, and there was steady progress toward a betterment until the bodies of the two upper lumbar vertebræ became involved. The child made a complete recovery eventually from both conditions.

Treatment.—The hygienic and medical management is similar to the treatment outlined for other cases of tuberculosis (p. 360). Adequate rest, high proteid diet, open air, and change of climate, when this may be supplied, should be provided. Drugs are of value only as a means of improving nutritional conditions. A combination which seems to possess real value in these cases is the following:

For a child three years of age:

℞ Liq. potassii arsenitis ..... ♏ xlviij
Liq. ferri albuminati ..... ℥vj
Syr. hypophosphitum (calcis et sodæ) q. s. ad ℥vj
M. Sig.—One teaspoonful in water after meals.

The medication is given for ten days, then omitted for five days, and then resumed. Interrupted medication may be continued in this way indefinitely.

Moderate exercise may be allowed if the temperature is normal.

Operation.—There appears to be but little unanimity of opinion as regards the advisability of operative procedure in tuberculous peritonitis. Some authors are ardent advocates and give statistics to prove their contentions; on the other hand, other physicians, with equally large experience, disapprove of the operation. My own course is as

follows: If there is a marked ascites with much discomfort, interfering with respiration and heart action through pressure on the diaphragm, operation is advised at once. It would seem that early operation furnishes the best chance for relief in the acutely active cases. Evidence of interference with normal peristalsis, as indicated by persistent constipation and visible peristalsis, means that intestinal obstruction is imminent, and under such conditions immediate laparotomy is advised. When the above conditions do not obtain, I have found it advisable to postpone operation, and treat the patient along the lines already referred to.

Some of the cases seen by me were absolutely hopeless at the time, showing marked tuberculous processes elsewhere, and therefore were not considered fit subjects for operation.

The patient should be weighed once a week. In case of a continuous loss in weight and strength extending over five or six weeks, with or without fever, in spite of the advantage of diet, climate, and medication, operation is to be advised, regardless of the stage of the process, providing always that there is no active tuberculous process elsewhere. When the weight remains stationary or nearly so, and there is no evidence of advance in the abdominal lesions, it is safe to wait for a considerable time before undertaking operative measures.

Heliotherapy in Tuberculosis.—In the summer of 1912 Dr. Rollier, of Lysin, Switzerland, published his results in the treatment of surgical tuberculosis at the tuberculosis congress in Rome. In the town of Lysin are situated, on the snow-covered mountain, the pavillions where his method of heliotherapy is practised. It consists in exposing the body of the patient to the sun's rays in open galleries communicating with the wards and facing due south. The actual seat of disease is uncovered for five minutes only, to begin with, as there must be no blistering or burning of the skin; the next day the region is treated for two periods of five minutes each, separated by an interval of half an hour; and on the third day these exposures are lengthened to fifteen or twenty minutes. At each séance a larger area of skin is exposed so that at the end of two weeks the entire body, except the head, is being exposed to the rays of the sun. The head usually requires protection for a little longer time so as to prevent congestion. Plaster jackets are rarely used, while abscesses are aspirated and exposed in the usual manner. In the jackets windows are cut so that portions, at least, of the body are exposed.

According to Rollier, improvement is evinced almost immediately. Fever disappears, hemoglobin and red cells approach and attain their normal standards, while increase in weight is most noticeable. Out of 369 cases of surgical tuberculosis treated thus, in 284 (78 per cent.) recovery was obtained; in 48, improvement; in 21 the condition remained stationary, while 16 (4 per cent.) succumbed. In visceral tuberculosis the results were excellent. In 27 cases of peritonitis and enteritis there were 17 recoveries, 3 improvements, and 3 deaths. Certainly no other treatment has given such results.

The different rays (blue, indigo, violet) certainly each play a part in the curative process as well as the more recently discovered infra-red and ultra-violet rays. Some are analgesic, some have a tonic action, and others penetrate deeply into the tissues. There is no attempt to utilize any particular ray as Finsen did. Experiment has shown that fully 25 or 30 per cent. of sun's rays are absorbed by atmosphere and dust and that to make the treatment efficient, altitude is of prime importance.

DACTYLITIS

Dactylitis consists of a fusiform swelling of one or more of the phalanges. (See Fig. 107.) There are two forms—*dactylitis syphilitica* and *dactylitis tuberculosa.*

Pathology.—The lesion is the same in both types, consisting of a rarefying osteomyelitis. The process begins in the center of the bone, causing an enlargement of the medullary canal. At the same time, particularly in syphilitic types, there is a periostitis with deposit of bone cells, so that eventually the bone is of much greater circumference than other similar bony parts.

Fig. 107.—Dactylitis.

Suppuration and necrosis occur. A mere shell of bone may remain which, on undergoing further necrosis, may result in the loss of the finger or toe. The disease does not limit itself to one bone.

Illustrative Case.—In a recent syphilitic case all the fingers of both hands were involved and also the metatarsals of both great toes. The index- and middle fingers of the right hand suffered most. On the whole, both hands were alike and appeared almost webbed, due to the swelling of the proximal phalanges, while the distal ones tapered in a definite penciled fashion. There was apparently no pain, and the infant used the hands with perfect freedom. The *x*-ray plates showed a destructive osteitis involving the bones of both hands.

Differentiation.—Differentiation between the two types from the clinical appearance is impossible. When the lesion is multiple, it is more apt to be of syphilitic origin, although this is by no means certain, as I have seen multiple spina ventosa. The von Pirquet test and the Wassermann reaction, in the absence of disease elsewhere, will be required to establish the diagnosis, as the symptoms and appearance are identical in both forms.

Treatment.—Aside from the antisyphilitic treatment, the management of the two types is the same. Absolute rest of the parts appears to be essential for success. This is best secured by the use of splints, which must be kept bound on the fingers for months in such a way as effectually to immobilize them. In a recent case of the tuberculous form, successfully treated in this way, the finger was kept in splints for six months. When abscess and necrosis occur, the case must be treated along surgical lines, the immobility of the parts being maintained as completely as the conditions allow.

The Newer Diagnostic Methods

TUBERCULOSIS

Tuberculin is used as a diagnostic agent to detect early, latent, or doubtful cases of tuberculosis; it may be applied in three different ways: *subcutaneously, cutaneously,* and *in the eye.*

Subcutaneous Inoculation.—The dose used for diagnosis is larger than that allowable for immunization purposes, from $\frac{1}{10}$ to 5 or 10 milligrams being used, according to the age of the child. If the patient is tuberculous, the injection is followed in eight to twenty-four hours by a rise of temperature, a certain amount of malaise, tenderness at the seat of injection, and râles over the suspected lung area. The reaction is general as well as local. The temperature falls within twenty-four hours. No reaction occurs in non-tuberculous cases, while in 95 per cent. of those of tuberculosis the test is followed by a positive reaction. Absolute exclusion of tuberculosis, however, because of a negative result, is not possible. The test is applicable only to cases which do not run a temperature over 37.7° C. (100° F.), and is useful in doubtful and obscure cases. It may be necessary to repeat the inoculations two or three times before a positive reaction occurs; the initial small dose of $\frac{1}{10}$ milligram being followed in three days by another of one milligram, and again, if necessary, in three days by another of 3 or 5 milligrams in older children.

A second subcutaneous test is the puncture or stick reaction of Hamburger, who claims that his is the most sensitive test. In older children $\frac{1}{1000}$ to $\frac{1}{100}$ milligram of tuberculin is injected just beneath the skin. Within twenty-four hours the local reaction begins and lasts for five or six days. The redness and induration are visible at the point entered by the needle, and also at the place where the injected fluid is deposited.

Cutaneous Inoculation.—This method of vaccination with tuberculin was introduced by von Pirquet. A small superficial scarification is made on the forearm, and a drop of undiluted tuberculin is applied. An untreated scarified area of equal size is made at the same time for control purposes. In cases of active tuberculosis the reaction begins within twenty-four hours. A small red papule forms, surrounded by a limited area of redness and induration. In four to eight days the nodule has disappeared. The control scarification heals without any inflam-

matory sign. Von Pirquet himself uses a fine boring instrument instead of scarifying. The method is most valuable in infants and children under two years of age. A positive reaction is accepted by von Pirquet as proof positive of tuberculosis. A negative reaction, on the whole, means absence of any tuberculous focus. My own observation substantiates von Pirquet's statement; a positive reaction means tuberculosis in almost every case. This we have proved by other means, such as examination of spinal fluid and sputum, and autopsy findings.

In the last days of a miliary tuberculosis the reaction fails to appear in about half the cases. Furthermore, in cachectic conditions from any cause the reaction does not appear. During the eruptive stage of measles it is absent in 100 per cent. of tuberculous cases, while in scarlet fever the negative result is less constant, the reaction failing to appear in 85 per cent. of the cases. After the eruption has disappeared a von Pirquet reaction may be obtained. Tuberculous patients suffering from diphtheria or typhoid fever also fail in some instances to react to the cutaneous tuberculin test.

Differential Cutaneous Reaction.—Detrè devised this method of diagnosing human from bovine tuberculous infection. He used the filtrates of bouillon cultures of human and bovine tubercle bacilli, applying them by the von Pirquet cutaneous method, making the scarifications and the applied drop of fluid as nearly alike as possible. The diagnosis is determined by the relative size of the resulting reaction papules, which Detrè carefully measures. Thus far, most observers find that in the majority of cases the two reactions are equally marked, and it has not yet been established that the differential diagnosis between human and bovine tubercle bacillus infection is possible by this means.

The Moro Inunction Test for Tuberculosis.—Equal parts of old tuberculin and anhydrous lanolin are used in the form of a salve. The dose is about one gram of the ointment, rubbed into an area of healthy skin about 5 cm. in diameter. The application is made in the epigastric or submammary region, a rubber finger-cot or glove being used to rub the ointment into the skin for three-fourths of a minute or more. The inoculated area is exposed to the air for ten to twenty minutes, and no dressing is applied. It is well to clean the site of the inunction with alcohol before applying the salve, and also to ring the inoculated area. A control with plain lanolin is made on another part of the skin. The reaction manifests itself in ten to seventy-two hours, but in the majority of cases it does not appear later than the second day. The eruption which appears is papulovesicular in character, with an erythematous areola around the individual papules. In a severe reaction the areolæ may coalesce. The papules vary in number from very few (1 to 4) to very many (50 to 100). Itching sometimes occurs. The eruption persists for several days; in severe cases it may be apparent for seven to ten days, and may be followed by pigmentation and desquamation. The test is simple and harmless. As a rule, the von Pirquet reaction is fully developed several hours before the inunction (Moro) reaction.

Ophthalmo-reaction.—This was first described by Wolff-Eisner and

shortly afterward by Calmette, and consists of the instillation of one drop of 0.5 per cent. solution of tuberculin into the conjunctival sac of the healthy eye of the patient. Within twelve hours swelling and redness are at their height, and gradually subside in twelve hours more. The plan in use at the Babies' Hospital is to instil the tuberculin at midnight. The reaction can then be studied during the entire next day. Wolff-Eisner insists emphatically that only one instillation is permissible in one eye, that a positive reaction means active or latent tuberculosis, and that failure to obtain a reaction in a clinically positive case of tuberculosis indicates error in technic and not in the method itself. The only exception to this rule, as in the cutaneous method, is that of cases in the very late stage, whose responsive power is exhausted. If no reaction occurs in an apparently positive tuberculous case, the other eye may be used for a second test. Any ophthalmic inflammation, and especially any suspicion of eye tuberculosis, is absolute contraindication to the use of the method. If the test is properly applied in healthy eyes, no untoward results occur.

The advantage of both the cutaneous and the ophthalmic methods over the subcutaneous is that they obviate the possibility of spreading the tuberculous process, since no general reaction follows their application. Both local methods are based upon the principle that in the course of a tuberculous infection all the cells of the body are sensitized to the products of the tubercle bacillus. When, therefore, a minute quantity of such products (tuberculin) is brought into direct contact with a sensitized and vascular tissue like the skin or conjunctiva, a rapid inflammatory response occurs.

Holt believes that for general use von Pirquet's test is to be preferred to all the rest.

TUBERCULIN SKIN REACTIONS IN INFANCY

Dr. Alan Brown, Resident Physician at the Babies' Hospital, New York,* in a study of 650 hospital cases, found that 70 per cent. of the cases under two years of age giving a positive reaction proved fatal. The lesions were, with but rare exceptions, general in distribution.

That infants show a high degree of susceptibility to tuberculosis was shown by the fact that of 61 infants in whom a definite history of exposure could be obtained, 41 responded to the test, and of these, 37 died of tuberculosis.

In infancy a negative cutaneous reaction, except in moribund cases or in children suffering from measles, is almost conclusive evidence against the existence of a tuberculous focus.

Among 100 consecutive cases of tuberculosis, 95 gave a positive reaction, the remaining 5 patients being moribund on admission to the hospital.

In a child in whom tuberculosis is suspected the test should be repeated if at first it proves negative.

* "Archives of Pediatrics," July, 1913.

CHART SHOWING THE HIGH DEGREE OF MORTALITY IN INFANTS RESPONDING TO THE CUTANEOUS TEST. ALL FATAL CASES PROVED TUBERCULOUS EITHER BY AUTOPSY OR THE FINDING OF BACILLI IN SPUTUM OR CEREBROSPINAL FLUID

Age	Number of Cases	Number with Positive Reaction	Number of Positive Cases with Autopsy or Bacteriologic Examination	Number of Positive Cases Proved to be Tuberculous by Autopsy or Bacteriologic Findings	Number of Negative Cases that Came to Autopsy	Number of Negative Cases which Showed no Tuberculosis at Autopsy
1 to 3 months	62	3	3	3 or 100 per cent. of + reactions.	10	10
3 to 6 months	102	7	6	6 or 85 per cent.	13	13
6 to 12 months	218	43	35	35 or 81 per cent.	19	18 Test not reported in one case.
12 to 18 months	156	37	20	20 or 54 per cent.	15	15
18 months to 2 years	112	24	15	15 or 62 per cent.	4	4
Total, 0 to 2 years	650	114	79	79 or 70 per cent. of + reactions.	61	60

CHART SHOWING THE BEARING OF EXPOSURE TO TUBERCULOSIS ON THE MORTALITY IN THE INFANT

Age	Number of Cases	Number of Cases with a Definite Family History	Number of Cases with Definite Family History that Reacted	Mortality of Cases with Definite Family History that Reacted
1 to 3 months	62	4	3	3
3 to 6 months	102	8	4	4
6 to 12 months	218	30	20	20
12 to 18 months	156	10	10	6
18 months to 2 years	112	9	4	4
Total, 0 to 2 years	650	61	41	37 or 60 per cent. of those giving a history of contact.

WASSERMANN TEST FOR SYPHILIS

The Wassermann serum reaction is the application of the complement fixation or deviation test to the diagnosis of syphilis. As introduced by Wassermann, Neisser, and Bruck, it required the use of guinea-pig complement, the serum to be tested, antigen consisting of extract of syphilitic liver, and a sheep's hemolytic system. By sheep hemolytic

system is meant an immune rabbit serum prepared by inoculating rabbits with washed sheep's erythrocytes, and a suspension of washed red blood-cells of the sheep. In the presence of fresh guinea-pig serum (complement) such an immune serum has the power of hemolyzing the red blood-cells. In the same way human hemolytic system means the combination of washed human erythrocytes and an immune serum prepared by inoculating rabbits with washed red blood-cells of the human type.

If the serum to be tested contains immune bodies specific to the antigen used, these will, in the presence of complement, unite with each other and bind the complement. The addition of the hemolytic system will then cause no change in the tubes, *i. e.*, hemolysis will not occur. If the antigen and the immune serum are not specific, then the complement is left free to unite with the hemolytic system and hemolysis occurs. This is called the *complement fixation* or *deviation test.*

As simplified by Noguchi, the test requires much smaller quantities of guinea-pig complement, the serum to be tested, antigen consisting of human or animal tissue extract, and human hemolytic system. For practical purposes one cubic centimeter of the patient's blood will give an ample amount of serum for the test. This is readily obtained from the finger and caught in a curved glass tube.

The Wassermann seroreaction is positive in 98 per cent. of cases of congenital syphilis, but only in 66 per cent. of latent syphilis. During the primary stage of acquired syphilis 90 per cent. of the cases give a positive Wassermann test; during the secondary stage, 96 per cent.; and during the tertiary stage, 83 per cent. react positively.

Craig has found that the reaction may disappear from two to four weeks after the institution of mercurial treatment, but it may return when the treatment is stopped; therefore it is not definitely established that the disappearance of the reaction justifies the conclusion that the disease has been cured, and that treatment may be discontinued.

Noguchi found that after treatment with salvarsan the reaction may disappear within two weeks in promptly cured cases, although it may not do so for four or five weeks.

NOGUCHI BUTYRIC-ACID TEST FOR SYPHILIS

This test is based upon the fact that the globulin reaction in the blood-serum and in the cerebrospinal fluid is increased in syphilis. In the case of the blood-serum the test is too complicated to be used anywhere except in a highly equipped laboratory, and, moreover, it is not needed in children, since Wassermann's serum reaction answers all practical purposes. Applied to the cerebrospinal fluid, the Noguchi test is very simple and is carried out as follows: One-tenth to $\frac{2}{10}$ c.c. of cerebrospinal fluid, which must be absolutely free from blood, is mixed with $\frac{1}{2}$ c.c. of a 10 per cent. solution of butyric acid in normal saline and boiled. Then $\frac{1}{10}$ c.c. of normal sodium hydroxid solution is quickly added, and the whole is boiled for a few seconds. A granular or floccular precipitate indicates a positive reaction. The appearance of the precipitate

within a few minutes indicates a considerable increase in globulin, while weaker reactions may not appear for an hour. Two hours should be the time limit.

Normal cerebrospinal fluid with this test gives a slight opalescence and occasionally turbidity, but the granular precipitate does not occur at all or only after the time limit has been reached.

A positive reaction occurs with the cerebrospinal fluid from any case of syphilitic or parasyphilitic affection, and also in all acute inflammations of the meninges, whether due to the meningococcus, the tubercle bacillus, the pneumococcus, the streptococcus, or the influenza bacillus. The reaction is also positive in the early stage of poliomyelitis. Such conditions can, of course, be readily differentiated from syphilis. In acute luetic meningitis the presence of Treponema pallidum in the cerebrospinal fluid will serve to exclude the other forms of meningitis. Such a case has been reported by Rach* in a child four months old. In hydrocephalus, the cerebrospinal fluid gives a positive butyric acid test in cases which are of syphilitic origin. When the amount of cerebrospinal fluid is increased without inflammation of the meninges, as sometimes happens in pneumonia, the fluid does not give a positive butyric acid test.

In children Noguchi's test is most valuable in differentiating between inflammatory and non-inflammatory conditions of the meninges.

LUETIN TEST

The luetin test was originated by Noguchi, and is based upon the fact that individuals who have been affected for some time with certain pathogenic organisms develop a hypersensitiveness to those organisms or their constituents. Emulsions of pure cultures of Treponema pallidum killed by heat are prepared, and 0.057 c.c. injected into the skin of the upper arm by means of a very fine needle. A control is made on the other arm. In positive reactions a red, indurated papule forms within twenty-four to forty-eight hours, and is surrounded by a diffuse zone of redness. Induration and redness increase for three or four days, then subside, and the thickening disappears within a week. In cases of late hereditary syphilis, the papule, instead of subsiding, may go on to the formation of a pustule, which heals within a week, leaving almost no scar. Very rarely the reaction may be delayed, so that after three days the result is called negative, yet after ten days or longer small pustules form and heal in the usual way. Marked constitutional symptoms very rarely accompany the reaction. A slight rise of temperature lasting for a day is the rule in positive cases.

In non-syphilitic patients there appears, twenty-four hours after the application of the emulsion, a small area of erythema without pain, itching, or induration. Occasionally a small papule forms within twenty-four to seventy hours; it also disappears without induration.

The reaction is apparently specific for syphilis, and persists as long as Treponema pallidum survives in the body. It is specially useful in

* "Jahrb. f. Kinderh.," 1912.

late cases in which the spirochete can no longer be demonstrated microscopically and in which the Wassermann reaction is indecisive. It seems to outlast the seroreaction after antisyphilitic treatment has been given. In cases of hereditary syphilis it is present in 91 per cent. to 100 per cent. of the cases.

THE WIDAL REACTION FOR TYPHOID FEVER

To make Widal tests it is necessary to keep in stock a well-agglutinating strain of typhoid bacillus. A bouillon culture which has grown not longer than six to eight hours in the incubator or twelve to eighteen hours at room temperature should be used for the reaction. The blood to be tested should be obtained in a small glass tube of the Wright pattern, 0.5 to 1 c.c. in amount, sealed at both ends, and the serum allowed to separate. Sterile physiologic salt solution or bouillon may be used as the diluent. A porcelain palette with six or more cup-like depressions is a convenient receptacle for holding the dilutions.

By means of a capillary tube marked by a wax pencil 1 drop of serum and 9 drops of salt solution are mixed in one of the palette cups, making a dilution of 1 : 10. From this stock other dilutions are made: 1 drop to 4 of salt solution equals a dilution of 1 : 50, etc. The addition of 1 drop of culture to 1 drop of a 1 : 10 dilution of serum makes a dilution of 1 : 20. This is examined on a hollow slide with a No. 7 lens. Controls of the culture alone, and of culture plus normal serum, should be made at the same time. Cessation of motion and clumping of the bacilli within one-half to one hour, in a dilution of 1 : 40 or 1 : 60, constitutes definite proof of typhoid infection.

With blood dried on a slide the test cannot be accurately made. Cultures of typhoid bacilli killed with formalin have been used for making the Widal test, but the method has nothing to recommend it.

The Widal reaction does not give positive results before the end of the first week or the beginning of the second week of typhoid. It may continue to be positive throughout convalescence and for a period of six to eight weeks. Occasionally its appearance is deferred until convalescence or until a relapse comes on, but it is present at some time during an attack of typhoid fever in over 95 per cent. of all cases.

ANAPHYLAXIS

The second introduction of a foreign soluble proteid at an appropriate interval after the first introduction of that same proteid causes a train of symptoms designated by the term anaphylaxis. The first dose sensitizes the organism, while the second dose intoxicates. The time required for sensitization is ten days or longer, and its duration has been found to be as long as seven years.

The therapeutic use of immune sera, the majority of which are derived from horses, gave rise to anaphylactic phenomena which von Pirquet and Schick recognized and called serum disease. Some patients react after a first dose of serum, the symptoms appearing eight or ten days after its injection, and consisting of fever, skin eruptions,

muscle and joint pains, and glandular swellings. Such patients, after the administration of a second dose, develop symptoms after a few hours or only after several days. The immediate reaction is characterized by a local edema at the site of the injection, increasing slowly for twenty-four hours, and then disappearing in two to five days. Fever and skin eruptions are also present, and in a small percentage of cases nausea, vomiting, and even collapse may occur. When the symptoms are delayed for several days, they usually occur suddenly and disappear within a day. They are similar to those following the injection of the first dose of serum.

In individuals who are asthmatic or afflicted with an idiosyncrasy to the odor of horses, a first dose of horse serum may cause an attack of respiratory distress with cyanosis or else of cardiac weakness with a fatal ending. In such cases we must assume that the sensitization was either inherited or acquired through the lungs or through the stomach. Experimental data support all three assumptions.

The tuberculin reaction is a local anaphylaxis in individuals sensitized to the proteids of the tubercle bacillus.

Hay-fever is a local anaphylaxis to the protein constituent of certain pollens.

Drug and food idiosyncrasies are anaphylactic in character.

XVII. UNCLASSIFIED DISEASES

RHEUMATISM

In a considerable proportion of the population there exist certain physical characteristics which set these individuals apart in a class by themselves. The constitutional condition referred to is well recognized, and various designating terms have been applied to it, such as the rheumatic diathesis, the rheumatic complex (Still), lithemia (Osler), and lithemic diathesis. The condition is, to be sure, but little understood. Nevertheless, if we admit that rheumatic fever (acute articular rheumatism) is due to a specific infecting agent, we must also admit that there is a favorable field for activity of this agent in certain members of the human race. Children who have the rheumatic symptom-complex as described below are those who most frequently develop acute rheumatism—articular (rheumatic fever) and endocardial (endocarditis).

The more prominent features of the rheumatic symptom-complex comprise lack of resistance to infection of the respiratory mucous membranes and the tonsils; pronounced lack of nervous balance, manifested by habit spasm; and a tendency to a spasmodic condition of the respiratory tract, as seen in bronchial spasm and catarrhal laryngitis. Another peculiarity, as relates to the nervous system, is absence of control during play; the patients become much excited, and waste much energy over trifles. In my consulting-rooms I have seen such children in ceaseless activity, which they apparently could not control. They are very apt to lack concentration. They are the children who have frequent "growing pains" and suffer from periodic stomach and intestinal crises. They are, furthermore, subject to eczema and urticaria. Children of this type are the offspring of those who have been similarly affected, or who have what they have learned to designate as rheumatism, lithemia, gout, uric-acid diathesis, etc.

Often in the offspring of these individuals will be found a combination of the above tendencies: the association of habit spasm, chorea, and endocarditis; of eczema, articular rheumatism, spasmodic bronchitis, asthma, tonsillitis, catarrhal laryngitis, and frequent rhinitis; of tonsillitis, growing pains, chorea, endocardial and articular rheumatism; the association of cyclic vomiting, tonsillitis, and the nervous manifestations of bronchial spasm with acute bronchitis. In two boys, brothers, who had cyclic vomiting, there was invariably an attack of tonsillitis first and then the vomiting, which was in turn followed by asthmatic bronchitis. None of the attacks was very severe, but each time the same sequence was carried out. I have witnessed the above associations in too many cases to ascribe them to a coincidence. Further, it is this type of child who develops articular rheumatism and endocarditis.

Question: Has this class of children rheumatism? The answer is not easy. They are suffering from a toxic process which manifests itself in different ways, even in the same child, and often in a way that bears no relation to normal growth and development. The condition, whatever it may be, constitutes an entity. Examination of the blood and urine tells us nothing of consequence. It is this "entity" that furnishes the field of action for the immediate pathogenic agent of acute rheumatism, as evidenced by the joint and heart involvement. Whether chorea is to be placed in this class or is a manifestation of selective action of the systemic toxemia is a matter to be decided. Poynton and Paine claim to have demonstrated the diplococcus in the cortex.

Etiology.—The chemicophysiologic defect appears to be in the liver, in the nature, probably, of defective oxidation. At any rate, the usual bodily functions are not apparently involved. If the patient of this type shows physical defects, it is more from the effects of the various ailments occasioned than from the results of the toxemia on the organs.

The age incidence is of interest. Infants who suffer from eczema, who are susceptible to bronchitis, and in whom it is of the spasmodic type, often show the rheumatic tendencies later in life. The more active manifestations, however, do not appear until the child has passed the period of infancy.

The observations and conclusions arrived at have been made in private practice. The hospital does not furnish an opportunity for observations on a child, carried through several years, as is necessary in order to know the patient from every standpoint. Those who have not had a large private work with children for a considerable period, or who have not carefully watched their patients, will not appreciate the conclusions expressed.

Treatment.—It is obvious that children of the above type show a particular predisposition to certain affections, and a decided lack of resistance to a particular form of infection—that which occasions acute rheumatism. The prevention of cyclic vomiting, spasmodic bronchitis (recurrent), chorea, and the other conditions referred to depends upon a proper management of the vice of constitution.

In tonsillitis two factors are operative: the vice of constitution predisposes to attacks, producing diseased tonsils, which adds the feature of local infection of different kinds, and which necessitates the removal of the tonsils. Growing pains, habit spasm, tendency to recurrence of eczema, and the various nervous manifestations enumerated may be controlled largely through right treatment of the "rheumatic complex."

The first and most important step in the treatment relates to diet.

Diet.—These children have a poor fat and sugar capacity, particularly for cane-sugar and cow's-milk fat. The nearer the approach to a vegetable and cereal diet, the better for the patient.

The nitrogenous foods allowed are poultry, fish, and egg-whites. Sugar of the arts is not to be permitted. Vegetables and stewed fruits and skimmed milk puddings may be freely used. Skimmed milk or

buttermilk may be given with the morning and evening meal. All cereals are permissible.

It will be seen that there is no trouble in establishing a well-balanced ration. Children will readily learn to do without sugar. There is little or no trouble in feeding cereals without sugar. With stewed fruits and puddings, saccharin may be used in small amounts. I have many children taking stewed fruits, cereals, and puddings without a particle of a sweetening agent. Puddings and junket are to be made with skimmed milk. The fat in the egg-yolk is particularly toxic to some of these children, particularly those who have cyclic vomiting. Egg-yolks are accordingly not used in puddings. When one whole egg would ordinarily be used, the whites of two eggs are used instead. A custard may be made as follows:

White of one egg.
Saccharin.
One-third cup scalded skimmed milk.
10 drops of vanilla.
10 grains salt.
Stir white of egg with silver fork. Add milk gradually, salt, and flavoring. Strain and bake somewhat longer than for ordinary custard.

In many instances I have seen rheumatic children suffering from some one or more of the above-mentioned conditions, together with anemia and a stationary weight, coated tongue, and loss of appetite, make astonishing gain without other treatment when the sugar and cow's-milk fat were removed from the diet. Three meals a day should be given. A free daily bowel evacuation is to be provided for if constipation is a feature (p. 234).

If there is much malnutrition, the scheme of living, as suggested in tardy malnutrition, is carried out (p. 92).

The Bath.—The child should be given a bath at bedtime, followed by a cold splash or douche. After the bath, while the feet remain in the warm water, a quart or two of cold water should be thrown over the body. The degree of cold may vary—80° F. to 70° F. at first; after a week or two water as it runs from the faucet may be used, regardless of the season, if the child enjoys it. After the cool douche the patient should be vigorously rubbed with a bath-towel and put to bed.

Drugs.—The only drug necessary, other than perhaps an appetizer or a laxative, is bicarbonate of soda, which should be given in interrupted dosage—from 15 to 30 grains, three times daily, depending upon the age and requirement. The soda is to be given after meals for ten days, with a free interval for five or ten days, when it may be resumed. After a period of a few weeks the soda may be discontinued, but the diet must be kept up indefinitely. These children cannot bear alcohol, and it should not be included in their tonic or restorative medication. When there is a high degree of systemic poisoning which resists the above measures, sodium salicylate—rarely more than 5 grains—should be given three times a day, after the interval method, with the bicarbonate of soda. True salicylate, that made from wintergreen oil, should always be advised.

All the measures suggested, without the withdrawal of sugar and free fat largely from the diet, are of little avail.

Illustrative Cases.—Case 1.—A case which is characteristic of many was that of a boy, two and one-half years of age, a scion of one of America's most noted families. When the boy came under my care he was having periodic attacks of catarrhal colds, associated with cyclic vomiting. The attacks would last for two or three days and were not very severe. There was rarely fever. He had been treated for these repeated colds by different physicians with expectorant drugs and local chest applications, all of which, as might be expected, were without effect. He was given the dietetic and drug management, as indicated above; and notwithstanding the fact that there had been attacks every fourteen days, there has been but one attack in the two years under treatment. First cousins of the child have habitual colds with spasmodic bronchitis.

Case 2.—A most remarkable case was that of a girl who came under my care in early infancy for an intense and obstinate eczema. From this she recovered, and when one year of age developed cyclic vomiting. During the next two years there were frequent attacks of cyclic vomiting, spasmodic laryngitis, and bronchial asthma. The association of these conditions has been previously referred to.

Recurrent Bronchitis.—Asthmatic bronchitis is often dependent upon the rheumatic state, and repeated attacks suggest the degree of the vice of constitution.

Illustrative Cases.—Case 1.—A girl eight years old came under my care because of repeated attacks of bronchitis. The mother, a woman of unusual education and refinement, stated that the child had had an average of two attacks of bronchitis monthly during the previous year, and at least one attack every month since she was five years of age. On my expressing some doubt as to the frequency, the mother stoutly maintained that her statement was correct. The family lived in Brooklyn, and had been told that the child could not remain there during any portion of the year. She had spent the colder months at different winter resorts, with very little, if any, resultant effect upon the severity or frequency of the attacks. The child was pale and inclined to be overstout. There had been no other illness of consequence. The attacks were peculiar in that they were of short duration, but very severe. There was usually a temperature range from 100° to 101° F., associated with cough, difficulty in breathing, and occasional attacks of marked air-hunger. The attacks were always accompanied by severe coryza. The patient came to me at the end of an attack. An examination of the chest showed throughout a fairly even distribution of mucous râles involving the smaller tubes. Aside from the bronchitis and secondary anemia, the examination was negative. The child had attended school at irregular intervals, but only for a few weeks of her life. While getting the history I asked, as a matter of routine, if the child snored or if she were a mouth-breather. This caused the mother to remark that the child had been under the care of throat specialists at different times, and each physician had removed a set of tonsils and a set of adenoids! The mother did not think that there was very much left. There was no sign of a tonsil and the nasopharynx was free. In spite of a normal rhinopharynx, the colds had continued. In taking the history I had learned that the family was rheumatic on both sides for at least three generations. The mother claimed to have suffered a great deal from rheumatism. In getting the personal history I asked if the child was fond of red meat. The reply was that she lived on it, and cared for little else, with the exception of sugar. Here was a girl, eight years of age, who would not drink milk until sugar had been added to it. Cereals, stewed, and raw fruits were loaded down with sugar before she would touch them.

In my instructions as to the treatment, red meat was allowed once every second day and sugar was reduced to a minimum—probably not more than one-fifth the usual amount being given. The child was to be bribed, if necessary, to eat green vegetables, cereals, and fruits. Expectorant and cough mixtures were discontinued. She was given 20 grains of the bicarbonate of soda and 20 grains of the salicylate of soda daily for three weeks. Later the drug treatment was continued at intervals during the remainder of the winter. She passed through the following winter without a sign of rhinitis, bronchitis, or asthma, although she continued to live in Brooklyn.

Case 2.—Another case somewhat similar was sent to me by a well-known rhinologist. The patient, a girl seven years old, had suffered from repeated attacks of

bronchitis and asthma and had been confined to her home a greater part of each winter. Her general condition was thoroughly wretched. Her family physician had attributed the condition to enlarged tonsils and adenoids, and the child had been sent to New York for operation. The operation was performed, and the child returned to her home. As a result the patient could breathe easier and sleep better, and suffered much less during her attacks of asthmatic bronchitis; but the frequency of the attacks was in no way affected. Early the following summer the patient was again taken to the rhinologist, who, finding the condition of the upper respiratory tract satisfactory, asked me to take charge of the case, remarking that he had "cut everything in sight and out of sight"! The treatment outlined above was instituted, and while the results were not so flattering, the condition was much improved; only three attacks occurred during the next twelve months, and the child gained 15 pounds in weight.

Repeated inflammatory involvement of the mucous membrane of the upper respiratory tract in children, particularly in the absence of enlarged tonsils and adenoids, strongly suggests a rheumatic element as a prominent causative factor.

There are other conditions, apparently of rheumatic origin, which are not associated particularly with the common manifestations.

Rheumatic Pleurisy.—Of this I have seen four cases. There was no pneumonia and no lung involvement of any nature. The fluid was sterile, and the patients never, in the years under observation, had further lung signs. The amount of fluid in each case was large. All the patients came for treatment because of interference with respiration. If there had been fever, it had in each instance subsided before the case came under observation. There was no pain and no evidence of discomfort other than the cyanosis caused by pressure.

In two of the cases there was a distinct history of rheumatism. These children were between two and six years of age.

Treatment.—The diet was given as outlined, with salicylate and bicarbonate of soda in dosage suitable for the age, with the result that in all the patients there was a complete absorption of the fluid in less than a week.

Peliosis Rheumatica.—In this unusual affection, which appears to be of rheumatic origin, purpura is a prominent symptom. In my patients the purpuric area has always been over the anterior portion of the lower extremities, and in every instance the disease has occurred in a patient who had had previous attacks of rheumatism or chorea, or in whom the rheumatic element was prominent, as shown by recurrent tonsillitis or recurrent bronchitis. A further proof of the rheumatic origin of the disease is the fact that the cases usually yield readily to treatment for rheumatism.

Treatment.—In one of my patients there were two distinct attacks, both of which yielded fairly well to the salicylate of soda and the iodid of potassium. The medication and diet are the same as those suggested for rheumatism. In case erythema nodosum accompanies the condition, local measures for the relief of pain (p. 570) will be necessary.

CYCLIC VOMITING (RECURRENT OR PERIODIC VOMITING)

This disorder is not one of the stomach, but an autointoxication, the stomach being the organ selected for the active manifestation of the

systemic explosion. Further, we are not dealing with a disease but a symptom indicating that the circulatory medium is overcharged with toxic substances. In other words, the patient, previous to an attack, is poisoned by his own metabolic products, which have not been eliminated. The child who has repeated attacks every two or three weeks is persistently poisoned in a similar manner.

Etiology.—The cases all represent defective oxidation, with the liver probably the principal organ at fault. These children belong to the class which I have included under the broad grouping of "the rheumatic complex" (p. 687). It will be noticed that this grouping includes other manifestations of systemic poisoning. Children who have cyclic vomiting often show many nervous phenomena, such as habit spasm, chorea, recurrent spasmodic croup, and spasmodic bronchitis. Rachford was the first to designate the underlying condition as a gastro-intestinal lithemia.

Secondary Etiologic Factors.—There are certain associated conditions which may precipitate an attack in a susceptible subject. Habitual constipation with the defective elimination is present in some cases. In other cases there is an associated intestinal crisis, with vomiting, high fever, and a sharp diarrhea. In others the onset may usher in a pneumonia or one of the exanthemata. Fright and fatigue and unusual excitement may play a part in inducing an immediate attack. Each of these factors, however, represents the spark that ignites the powder. If the condition of systemic intoxication did not exist, any of the influences mentioned would not produce the vomiting.

There are also seasonal influences. When the child can exercise and perspire, when he runs much and plays hard, elimination is better, and in many cases fewer attacks occur. Repeatedly, in getting the history of these cases I have heard that there are no attacks between May and October.

Symptoms.—The vomiting periods occur periodically. I have had cases in which the attacks occurred every nine days, and others in which they occurred but once in three or four weeks, or as many or more months. Each patient involuntarily arranges his own distinct periods, and he usually fulfils the contract.

Prodromal symptoms have been unusual. Now and then a mother will state that she can anticipate an attack by some peculiar behavior on the part of the child—that he will lose his appetite or that the skin over the face will have a greenish or yellowish tint, or that the breath will be offensive.

The symptoms are very characteristic, and occur in no other condition. The child, without prodromal signs, has a sharp attack of nausea and vomiting. The nausea is extreme; the retching and straining at emesis occur at frequent intervals. There is often no elevation of the temperature. There may be, however, decided pyrexia early in the attack. In Rachford's experience an elevation of temperature is the rule in young children. There is marked prostration. The child becomes very pale. The eyes are sunken, and the loss in weight is rapid.

Acetone bodies appear in the urine after two or three days of the vomiting. The temperature is usually subnormal. Neither food nor water is retained. The thirst is extreme. The patients beg for water, only to vomit it as soon as it is given. The vomited material usually contains hydrochloric acid, while in true gastritis free hydrochloric acid is absent (Rachford).

The illness may last but a few hours, with one or two vomiting seizures. In the average case the duration is from three to five days. My longest case was in a boy of three years who vomited persistently for thirteen days. In some cases the vomiting is sufficiently severe to produce hematemesis. A girl of eight years during an attack vomited such large amounts of blood that it was necessary to keep her under the influence of morphin given hypodermatically.

The Breath.—During the attack the breath usually has the characteristic odor of acetone. This is a sweetish odor, not unlike that of chloroform. I have had observant mothers, in describing the child's symptoms, refer to this sign without suggestion on my part. An examination of the organs and the secretions fails to show anything abnormal excepting the presence of acetone, diacetic acid, and oxybutyric acid in the urine, as described by Edsall.

In a mild or moderately severe case the vomiting stops abruptly and the child asks for food and retains it, providing reasonably simple food is given. In a few days he has made up the loss in nutrition and is as well as ever.

In more severe attacks the child may require several days to regain his usual health and vigor. The resumption of the feeding will necessitate considerable care.

Differential Diagnosis.—A first attack of cyclic vomiting may be confused with meningitis, acute indigestion, or the vomiting in acute nephritis, appendicitis, or intestinal obstruction. In the event of an abrupt onset in a first attack a diagnosis may not be made for a day or two. The differentiation laid down in some of the books is not dependable.

Thus the vomiting which occurs as the earliest symptom of tuberculous meningitis may be clinically identical with that of cyclic vomiting, and only by the appearance of other signs of meningitis or through lumbar puncture is the differentiation possible.

In acute indigestion there is a brief period of fever and one or two vomiting seizures, after which the case is well. In acute nephritis an examination of the urine readily settles the diagnosis. In appendicitis there are pain and spasticity and the vomiting is not continuous; in cyclic vomiting the abdomen is relaxed, soft, and not tender. Intestinal obstruction is an affection of infancy; cyclic vomiting rarely occurs before the second year, and usually not until after the third year. In intestinal obstruction, moreover, there are abdominal distention and the passage of bloody mucus, due to intussusception.

Prognosis.—The prognosis is good not only as regards life, but as regards the continuation of the attacks. I have seen but one fatal case.

Whether the periodic seizures continue depends entirely upon the management of the case.

Treatment.—*Treatment in the Interval.*—In describing the management of children who show the rheumatic complex, the influence of the intense carbohydrates and fat was referred to. In the cyclic vomiting cases the precaution of withholding these substances from the diet is one of the most necessary features of the interval management. Different authors refer to the fact that the use of milk in some children is productive of attacks. It is the fat content of the milk that produces the attack. These patients may take fat-free milk and buttermilk without inconvenience. The diet prescribed for the cyclic vomiting case is that laid down on p. 688.

Milk-fat, sugar, and egg-yolks are forbidden. Red meat may be given only in small amounts.

Medication.—For a child from three to ten years of age from 9 to 12 grains of wintergreen, salicylate of soda, or aspirin are to be given after meals daily in divided doses, for five days out of fifteen. During the ten days of rest from the salicylates 10 grains of bicarbonate of soda should be given twice daily after meals. This method of treatment must be continued for months. If the salicylate of soda interferes with digestion or with the appetite, aspirin in equal dosage may be substituted. Under this method of treatment in cases in which attacks had been occurring every month or six weeks the intervals have been increased to six months or a year, and in many cases the attacks have entirely ceased. Spasmodic treatment is of little value; only persistent treatment is effective, and there must be confidence and coöperation on the part of the family or any treatment will fail.

An important requirement in the management is that the patient live a normal child's life. There should be a suitable rest period after the midday meal. Three meals are to be given daily, and there must be one free bowel evacuation daily without the habitual use of enemata. A free green vegetable diet with stewed fruit will do much to accomplish this. (See Constipation, p. 234.)

Four cases seen during the past ten years have resisted the above interval management. One child did not have an attack for a year. The attacks then recurred. In these cases massage and making the patient work through carefully directed gymnastic exercises were sufficient, with the diet and interval medication, to control the attacks.

Treatment of the Acute Attack.—All food should be withheld. Hot bicarbonate of soda water, 10 grains to 8 ounces of water, is to be given freely—as much as the child will take—if he can retain it. If it is vomited, one teaspoonful is to be given at a time. If this or plain water is ejected, the stomach must be allowed to rest. Medication other than the bicarbonate of soda should not be attempted. After twenty-four hours, with a continuation of the vomiting, a colon flushing (p. 763) with 8 ounces of warm water containing 2 drams of bicarbonate of soda may be employed. This should be repeated at six- to eight-hour inter-

vals. It is astonishing to note how much of this solution will be taken up if the tube is introduced well into the colon.

Repeatedly I have known patients to retain two pints a day. The procedure supplies fluid, relieves thirst, and prevents prostration and loss in weight. At the same time the bicarbonate of soda furnishes the best antidote to the acid intoxication that exists. If the colonic medication is not well retained, it should be used but twice daily, so as not to establish an intolerance, as in severe cases this is the only means of sustaining the patient. Discretion must be used in giving food. Some children will have a disgust for all foods, and others will be as hungry as they are thirsty. This, however, is unusual. I have known these children to retain twice-baked bread and unsweetened zwieback when nothing else could be kept down. Further, when the vomiting ceases and the child is on the borderland of convalescence, some one of the dried bread-stuffs often answers better than does a fluid diet. In a general way, however, a diet of broth, gruel, skimmed milk, and dried bread is best for the first few days following an attack.

CYCLIC DIARRHEA

Excess of sugars and fat in the diet of children of the so-called lithemic type may produce characteristic gastro-enteric effects entirely independent of intestinal and stomachic conditions. Patients of this type represent those who possess a poor capacity for the metabolism of these substances.

Cases of this kind are not at all unusual, and are usually attributed to errors in diet, to fatigue, to overexcitement or nervousness.

Symptoms.—There may be a prodromal period of a few days, with foul breath, coated tongue, languor, and loss of appetite. More often the onset is sudden and without warning. There are sudden high fever, headache, vomiting, diarrhea, muscle soreness, and, rarely, delirium. Abdominal pain may be present, colicky in character. The fever rarely lasts longer than two or three days—often not longer than one day. The gastro-intestinal manifestation of the toxemia may persist for a shorter or longer time. Some children will have one or two vomiting seizures; others none. The intestines, however, are much disturbed. Loose watery stools are frequent, and defecation is attended with considerable pain and tenesmus. After an indefinite period of time—usually one to three days—the symptoms abruptly subside, and the child becomes hungry and begs for more food than is good for him. Usually after such an attack the child feels unusually well, and no evidence of the seizure remains. In the course of a few weeks the identical process is repeated, although the mother volunteers the information that the child has been carefully fed and that the attacks cannot be attributed to indiscretion in diet. Occasionally such cases are associated with cyclic vomiting.

Illustrative Case.—A boy six years of age almost always—such was the history—began the cyclic vomiting attack with the symptoms as described. Vomiting ordinarily did not begin until the fever and the urgent intestinal symptoms had subsided.

The attacks are quite apt to be followed by constipation. These gastro-intestinal crises become as distinctly periodic as those of cyclic vomiting and spasmodic bronchitis. I have treated a large number of these patients who have been brought solely because of the periodic attacks which are referred to by the mother or nurse as "indigestion," "gastritis," or "biliousness."

If the attacks are frequent, there will be the signs of malnutrition. Usually the patient has resistance of a low order and is apt to be nervous and pale. The muscles are flabby. The tongue may be habitually coated. The child is chronically tired, "or never quite well." This description obtains in the most severe cases. Children, however, who undergo the periodic attacks at intervals of several weeks suffer but temporary inconvenience. The acetone breath has been present during the attack in a few of my cases; its occurrence is the exception.

Illustrative Cases.—Case 1.—A girl, three years of age, of decidedly gouty antecedents in both parents, had, for the eighteen months previous to examination, attacks of "indigestion" every six weeks. There was no vomiting. The temperature rarely rose above 103° F. There was pronounced diarrhea with little mucus. At each attack she had been given castor oil and a reduced diet, and was well in four or five days. Between the attacks she was fairly well, excepting that the tongue was never clean and there was a persistent low-grade eczema on the neck and upper portion of the chest, which had resisted the treatment of different dermatologists. The child had been fed with reasonable care under medical direction. There had been no gain in weight during the year.

She was given a mixed diet of meat, poultry, fish, green vegetables, and cereals. One pint of skimmed milk or fat-free buttermilk was allowed daily. Sugar of every kind was prohibited. Raw fruit was not permitted. Ten grains of bicarbonate of soda were given daily for several weeks. During the twenty-one months of treatment there has been no suggestion of the former trouble.

Case 2.—A boy six years of age had repeated attacks of diarrhea lasting from two to ten days. The majority of the attacks occurred during the warmer months, but there were also three or four during the winter. There was fever, rarely higher than 102° F., and rarely vomiting. Dietetic restrictions as regards sugar and fat were carried out, and skimmed milk in small amount was allowed during the next three months,—July, August, and September,—a period during which he had never before been well. He now remained perfectly well, and during this time gained 1¾ pounds in weight. There has been no repetition of the attacks.

I could give many histories of cases in which the periodic intestinal crises were relieved by the withdrawal of fat and sugar from the diet, and by the free use of bicarbonate of soda for protracted periods. Starches appear to exert no influence on the condition. Sugar that is manufactured by the organism exerts no unfavorable influence.

Treatment.—As indicated, the treatment consists in withdrawing fat and sugar largely from the diet, and in the use of bicarbonate of soda. If constipation is present, I usually give 30 grains daily with sufficient aromatic cascara to keep the bowels active. Stewed fruits and cereals are usually readily taken without sugar. If necessary, small amounts of saccharin may be used for sweetening. Eating between meals is forbidden, and the child is made to take an after-dinner rest of one and one-half hours. Stress of all kind is avoided.

PERIODIC FEVER

Febrile cases somewhat resembling the above are of unusual occurrence. The clinical condition is that of periodic fever without another symptom.

Illustrative Cases.—Case 1.—The temperature in one of my cases, aged four years, ranged from 102° to 103.5° F. and lasted four to six days. This child came to me because of the periodic elevation of temperature which could not be accounted for. During his third year there were six of these temperature periods. In the fourth year there were four, all during January, February, and March. There was no gastro-intestinal association and no clinical evidence of disease to account for the temperature periods. The mother stated that "the breath smelled like chloroform" during the attacks. An exhaustive examination failed to detect anything wrong with the child other than a persistent erythema at the angle of the mouth on the right side. The patient was given a diet free from fat and sugar. Thirty grains of bicarbonate of soda were given daily. Two years have elapsed without a return of the temperature period.

Case 2.—In the case of another boy, aged six years, the temperature period persisted two to five days, and the range was 100° to 104° F. During the attack the tongue was coated and the patient complained of being very tired. The attacks appeared without warning and disappeared without other evidences of illness than the fever. There was no objective gastro-intestinal disturbance. In one year there were five temperature periods; during the next year, three.

In neither of these cases was there another sign of trouble than the recurring temperature; the children had been treated and examined repeatedly with an idea to determine the cause.

In all I have had six examples of this fever phenomenon. All the patients were relieved promptly by removing sugar and cow's-milk fat from the diet, and by the interval use of bicarbonate of soda.

RHEUMATIC FEVER (ACUTE RHEUMATISM)

Acute rheumatism is a rare disease in young children. Conditions described as rheumatism in infants and children under two years are usually scurvy or infectious peri-arthritis. The latter is not at all unusual, and the possibilities of scurvy are always with us. Among 1027 cases of rheumatism, Still saw none under two years of age. My own cases have all been in children after the third year. The majority of the cases occur between the fifth and ninth years.

It is a mistake to designate rheumatic fever or acute rheumatism as "acute articular rheumatism," as we see many cases in which the joint symptoms play a slight part, or no part at all, the heart bearing the brunt of the attack. Repeatedly, endocarditis or pericarditis has been the main manifestation of the disease.

Illustrative Cases.—Case 1.—A boy came to the out-patient service at the Babies' Hospital because of sore throat and a temperature of 101° F. There was a very mild tonsillitis, and for one night there had been pain in the left knee. An examination of the heart showed an extensive endocarditis involving both the aortic and mitral valves.

Case 2.—A girl, four years old, a subject to periodic colds and asthmatic bronchitis, had a mild seizure of this nature, requiring that she remain in bed for a few days. While examining the lungs I detected a soft systolic murmur. Three days later pain and swelling appeared in a knee-joint. A polyarthritis followed, involving in all nine joints. In this child the heart involvement preceded the joint symptoms several days.

It is not at all unusual to see endocarditis in the offspring of the rheumatic, without the previous existence of a painful joint. These cases, however, will afford the history of chorea or recurrent spasmodic bronchitis, frequent anginas, periodic gastric or intestinal crises, or growing

pains. In fact, endocarditis is far more often the manifestation of acute rheumatism than is inflammation of the joints.

On the other hand, many cases are seen in which the heart remains free, with the joint involvement of a most urgent nature.

Etiology.—That acute rheumatism is a manifestation of an infecting agent or agencies the majority of the profession are agreed. It will probably be demonstrated that more than one infecting agent may cause acute rheumatism in a child predisposed in the manner that I have attempted to describe in the previous chapter. Perhaps it will be proved that both bacterial and other toxic agents may cause the disease.

Symptoms.—(For endocarditis, see p. 378.) Like all diseases of an infectious origin, acute rheumatism may be so mild as to escape notice, or it may be most severe. In the *joint type* the first symptom is pain in the joint; this may be very slight, or it may be most intense—so intense that the bed-clothing may not touch the parts without increasing the pain. Between these two extremes there are all degrees of involvement. There may be neither swelling nor redness, or the swelling may be extreme, with marked redness, the part being twice as large as its uninvolved fellow. One joint or several may be affected. The pain and swelling usually begin in one, and subsequently affect others. The first joint to become inflamed is usually the first one in which the inflammation subsides.

The duration of the attack is also subject to much variation—it may last but a few days, or it may last for six weeks or longer. A case of average severity rarely lasts longer than two to three weeks.

There may be no temperature, or it may range from 103° to 105° F., depending entirely upon the severity of the infection.

Prognosis.—The prognosis for the immediate attack in articular rheumatism is good. All cases recover if there is no heart involvement. When there has been one attack, however, there is great liability of another, and parents should be made to understand this feature of the disease. In the second seizure the heart may be the part attacked.

Precautions.—In every case of joint rheumatism the heart should be examined daily for evidence of endocarditis and pericarditis.

Treatment.—*General Management.*—Rest in bed is an absolute necessity even in the milder cases. The diet of the patient may consist of milk, junket, gruel, toast, stale bread, weak tea, stewed fruit, and orange-juice. Vichy and lemonade may be given to drink. There should be one evacuation of the bowels daily.

Local Measures.—Considerable comfort may be furnished by local measures, which will permit the child to sleep, resulting in a much improved food capacity. The affected joint or joints should be comfortably supported on a cushion or pillow, and the parts kept well protected by cotton-wool or flannel dressings. The U. S. P. lead and opium solution which is used to moisten the gauze dressings will aid in relieving the pain. The joint should be loosely wrapped in strips of linen which have been wet with the warm solution. Over this should be placed oiled silk

to prevent rapid evaporation, and over all a flannel bandage. In the acute cases the dressing should be changed every hour until the pain is relieved. This can readily be done without disturbing the patient. A liniment composed of menthol, 2 drams, tincture of opium, 1½ ounces, and enough alcohol to make 6 ounces, applied on strips of linen and covered with oiled silk, is another local application which has been of considerable service in relieving pain. The dressing should be renewed every two or three hours as the case requires.

Drugs.—Various drugs, such as oil of wintergreen, aspirin, and combinations of the alkalis with the salicylates, have been used in a considerable number of cases. The most effective internal medication has been the bicarbonate in association with the salicylate of soda. The salicylate must be given in large doses. Two points, however, are to be kept in mind in the use of large doses of salicylate in children: its depressing effect upon the heart, and the tendency to produce derangement of digestion, as evidenced by nausea and vomiting. The salicylate should never be given with the stomach empty. It is given to the best advantage after meals, and always in solution. For a child five years of age, the following may be prescribed:

℞ Sodii salicylatis ..... ℥ij
Elix. simplicis ..... ℥iss
Aquæ ..... q. s. ad ℥iv
Sig.—One teaspoonful in plain water or in Vichy four times daily after meals.

There are about 24 teaspoonfuls in a 4-ounce bottle. The average teaspoonful, as is well known, holds more than one dram. Computing 24 doses to a 4-ounce mixture, we give this five-year-old patient 20 grains of salicylate of soda in twenty-four hours. The amount may be increased to 30 grains if the condition is serious. Larger doses than 30 grains for children of this age I do not consider safe, as I have seen such doses followed by irregularity of the heart action and cyanosis. The average child from eight to ten years of age will take 30 grains daily without inconvenience. At the third year I have given from 12 to 15 grains repeatedly, with most satisfactory results. The bicarbonate of soda may be given in combination with the salicylate, but it is best given alone in Vichy or carbonic water between meals. To a child five years old or under, 20 grains should be given in twenty-four hours. For children from seven to ten years of age, 30 to 40 grains daily is the amount required.

The dosage, both of the salicylate and of the bicarbonate of soda, should gradually be reduced as the condition of the child improves.

Later Treatment.—It is my custom never, willingly, to let a child who has once had an attack of acute articular rheumatism disappear from my observation. As the outcome of repeated attacks, endocarditis is likely to develop sooner or later. After one attack the parents should be advised as to the probability of a recurrence, and its dangers should be pointed out to them. They should be instructed to keep the child on a low meat and sugar diet, red meat never being allowed oftener

than once every second day, while sugar is to be given only in sufficient quantity to make the food palatable. Five days out of every fifteen, 10 grains of the salicylate of soda, separately or combined with 10 grains of bicarbonate, should be given daily. This should be continued for six months, when treatment for five days out of each month will suffice. In some cases I have continued this method indefinitely.

At the present time I have a considerable number of children who are receiving the interval treatment. Under this scheme of management a case is rarely seen which develops a second attack.

Joint rheumatism in an untreated case may later develop in a different joint; not infrequently endocarditis may be the next manifestation. After one attack of endocarditis a second attack, either alone or with joint association, is the rule unless the case is suitably managed.

In every child who has had acute rheumatism the tonsils should be enucleated and adenoid tissue in the vault removed.

RHEUMATOID ARTHRITIS; ARTHRITIS DEFORMANS; STILL'S DISEASE

Under the above headings may be noted those forms of chronic arthritis which occur independently of ordinary pyogenic infection, gonorrhea, syphilis, tuberculosis, rheumatism, and rachitis. Attempts at exact differentiation of the arthritides of this class rest in the main upon varying clinical manifestations which may or may not represent separate and distinct disease processes. In a recent reference to this subject Rachford* has emphasized three types of "rheumatoid arthritis" —(1) *Chronic arthritis with hypertrophic changes predominant;* (2) *chronic arthritis with atrophy predominant;* (3) *Still's disease.*

The condition last named is sufficiently striking to require special attention, and the points emphasized by Still are here mentioned.

Still's Disease.—The specific *etiology* is unknown. The disease is quite possibly of bacterial origin. Females are apparently slightly predisposed. Children are rarely susceptible after the sixth year.

The *morbid anatomic changes* comprise thickening and vascularization of synovial membranes, capsules, and ligaments of the affected joints, and, in advanced cases, moderate atrophic changes in the cartilage, with perhaps the formation of adhesions. Effusion is not an essential part of the process. Considerable enlargement of the lymphatic glands and spleen is a constant feature.

Symptoms.—The onset is usually gradual, but may be acute, with fever and chills. Primary stiffness in one or more joints is succeeded by progressive joint enlargement without bony involvement, ankylosis, or suppuration. The knees, wrists, cervical spine, fingers, ankles, and toes may be affected. Active and passive movements are restricted, and eventually atrophy and contracture of muscles may occur, without, however, impairment of electric reactions. The lymphatic glands are enlarged, particularly those related to the affected joints. The edge

* "Diseases of Children," B. K. Rachford.

of the spleen may usually be found below the costal margin. The blood shows a moderate anemia and occasionally a leukocytosis.

Still's disease is to be distinguished from rickets, syphilis, the various forms of muscular atrophy, and caries of the cervical vertebræ.

The *prognosis* is not favorable. The disease is not directly fatal, but its effects are crippling. Koplik reports a recovery.

The *treatment* of rheumatoid arthritis is largely symptomatic. An even climate, free from excess of moisture, is desirable. Anemia and malnutrition are to be combated in the usual manner. Massage and suitable applications may influence the local conditions favorably. In view of the possible influence of latent foci of infection upon the development of the disease, oral sepsis and intestinal putrefaction, especially, must be prevented. Pituitary extract is of possible value.

CHONDRODYSTROPHIA (ACHONDROPLASIA)

Achondroplasia is a disease of fetal life characterized chiefly by defective development of the long bones.

The terms applied to this disease constitute a long list. Some of these are "fetal rickets," "micromelia," "chondromalacia," "fetal chondritis," and "chondrodystrophia fœtalis."

Emerson, writing in Osler's "Modern Medicine," cites many examples from Egyptian, Grecian, and medieval art, which go to prove the antiquity of this disease. He further states that of all dwarfs, those with this affection have been most popular in the positions of court clowns and jesters. The condition has long been confused with rickets, cretinism, and certain types of syphilis. Parrot first made clear the pathologic distinctions in 1878, and Porak gave a very full account of the subject in 1889.

Etiology.—Heredity is an influential but not apparently an unfailing factor. In many instances there is no family history of a significant character. Emerson suggests that achondroplasia and rickets may be related, in spite of the usual variance in their manifestations and the evidence against the occurrence of so-called intra-uterine rickets. By many achondroplasia is thought to be due to defective function in one or more of the glands of internal secretion. Syphilis is sometimes associated with this affection, but cannot be said to be a cause.

Pathology.—The lesions are localized in the bones, more particularly the long bones and those of the base of the skull. The epiphyses are primarily affected. Here there is always defective formation of cartilage, whence the descriptive name, chondrodystrophy. Periosteal growth goes on, and, by invading the region which is normally supplied with bone by the cartilage-cells, impairs still more the cartilaginous formation of bone, interferes with the union of epiphysis and diaphysis, and checks the growth of the bone in length. The irregular coöperation of the chondral and periosteal tissues in the development and growth of the bones similarly explains the actual deformities in their shape. Most of the cases belong to the type known as *hypoplastic*. The epiphyses are normal in size, and there is impaired growth of the cartilage-cells.

In the *hyperplastic* form, however, which is rare, the growth of cartilage exceeds the normal, and the epiphyses are enlarged. In *chondrodystrophia fatalis malacia* the epiphyses are soft, due to decrease in the consistence of the intercellular matrix.

Symptoms.—The dwarf presents a peculiar appearance; to such a degree is this true that he is often a source of revenue. These individuals have normal intelligence, and being quick to turn their physical defects into pecuniary gain, they may often be seen on the vaudeville or comic opera stage doing minor rôles as foils to men of large stature. The trunk is of normal size, while the extremities are very short. The head may be involved. It may be very large, showing a dome-shaped contour, not unlike that of hydrocephalus. The features may be large, with broad nose and prominent cheek-bones. The forehead is usually wide, with the eyes set widely apart, due to the broad root of the nose. The facial appearance, as described, while usually present, is not necessarily a part of the picture. I have seen several cases in which the facial configuration differed in no wise from that of the general average of humanity, as shown by Fig. 108. The muscles of the extremities, while short, are very large and strong, and these little people oftentimes possess prodigious strength in lifting or carrying heavy objects.

Fig. 108.—Chondrodystrophia. Lateral view.

The appearance of the child is characteristic, further, in that the hips are very heavy and broad, this appearance being produced in part by the peculiar articulation of the thigh with the trunk. The articulation takes place at almost a right angle, due to the change in the contour of the neck of the femur. There is marked lordosis, the lumbar curve being markedly exaggerated. (See Fig. 108.) This causes a tilting and narrowing of the anteroposterior diameter of the pelvis, which in girls may be a factor influencing normal childbirth in later life.

The hands are usually square, and the fingers very short. The feet take on the same appearance, being short and thick.

Diagnosis.—Chondrodystrophia may be confused with rachitis or cretinism early in the first few months of life. Rachitis and chondrodystrophia have been confused, usually for the reason that chondrodystrophia is such a rare condition that it was not known to exist and consequently was not suspected.

The very short, thick extremities, together with the facial characteristics and normal mentality, are sufficient for a differentiation. Further, the changes due to rachitis are of gradual development, and are never present at birth. In chondrodystrophia the child, when very young, shows an appearance as characteristic as when he is two years of age or older.

Fig. 109.—Chondrodystrophia.

Cretins are very degenerate mentally. They are slow and stupid, exhibit no mental response, and show but little irritation upon manipulation. In chondrodystrophia the mental condition is usually normal; at least those with chondrodystrophia cannot be placed in the class with the mentally defective.

Prognosis.—I disagree with those who claim a high infant mortality in chondrodystrophia. I fail, however, to see that mortality statistics, in view of the very few cases that exist, can be of value.

Physical Health.—I have had but four under my professional direction as infants, and all are well and thriving in their own way. One, now about six years old, is the offspring of a mother who is a chondrodystrophiac. Both men and women dwarfs are fertile. Giving birth to children is often a dangerous procedure, because of the anteroposterior narrowing at the pelvic brim and a tilting of the pelvis.

Treatment.—Treatment is of no avail, no means having been discovered to induce growth.

CRETINISM (INFANTILE MYXEDEMA; CRETINOID IDIOCY)

Cretinism was described by Paracelsus early in the seventeenth century. Until the middle of the nineteenth century, however, the disease was only imperfectly differentiated. Fagge described the sporadic form in 1871, and in 1873 Gull emphasized the similarity of this disease to adult myxedema. Some years later, following the experiments conducted by Victor Horsley, a commission appointed by the Clinical Society of London reported that myxedema and cachexia strumipriva were identical, that sporadic cretinism was myxedema occurring in childhood, and that endemic cretinism was closely allied to myxedema. The successful work of Schiff, von Eiselsberg, and Horsley in the artificial grafting of thyroid gland induced George R. Murray, in 1891, to employ hypodermic injections of an extract of the gland in the treatment of myxedema. Howitz, Fox, and MacKenzie obtained equally good results from thyroid medication by mouth. The wonderful success of this form of organotherapy during the five years following its initial use led Osler to write: "Not the magic wand of Prospero, or the brave kiss of the daughter of Hippocrates, ever effected such a change."

Fig. 110.—Cretin four years old. Never received thyroid treatment.

Cretins usually do not come under observation before the sixth month. Not much is expected of a baby a few months old, and if he is very quiet and slow at noticing his surroundings, the fact is attributed to his tender age or to his being a good baby. When, however, at the fifth, sixth, or seventh month, he fails to show the usual response for his age, medical attention is called to the condition. My youngest patient was three months old. When first seen, the patients have usually been from six to eighteen months old. My oldest case was four years of age. A cretin girl was three years old (Fig. 111) and weighed 15 pounds, 3 ounces.

Etiology.—It is undoubtedly established that the "condition" termed cretinism depends upon the absence of the thyroid secretion, and that the various degrees of cretinoid idiocy hinge upon the partial or complete absence of the thyroid gland. Cretinism varies in degree and in the time of its development. In typical cases (Fig. 110) there is complete absence of the thyroid gland; in others, showing the disease in less severe form, an impaired thyroid is found.

Pathology.—In 16 autopsies collected by Fletcher Beach the gland was absent in 14. In 100 cases of Curling, Fagge, and Iphophon the thyroid was found absent in 25; in the other 75, various connective-tissue and colloidal changes were observed. In endemic cretinism ("not found in this country," Osler) alterations are found in the thyroid consisting of partial or complete degeneration, which may be either atrophic or goitrous in its inception; or, as Getzowa has described, cases are found in which atrophic areas and goitrous degenerated nodules alternate in the same gland. In sporadic cretinism there is usually congenital absence, while in infantile myxedema due to acquired loss or perversion of thyroid function in the early years of life the symptoms vary according to the amount of functional disturbance of the gland. According to Kocher, in myxedema there is always abolition of the function of the gland, which at autopsy is never normal. In the majority of cases it is replaced by a band of tissue (Virchow); at other times, by adipose tissue without a trace of the thyroid artery (Stilling).

Fig. 111.—Cretin three years old. Before treatment.

Fig. 112.—Cretin after thirty-four days' thyroid treatment.

Ord was the first man to examine microscopically the thyroid in a case of myxedema. In the majority of instances neither Virchow nor Horsley, in their extensive observations, was able to find vestiges of acini or thyroid cells—bunches of connective tissue occupying the region of the gland. Stilling made similar investigations,

and found the thyroid artery missing, while Langhans states the changes to be those of an interstitial inflammation, with embryonal cell infiltration; in fact, an inflammation comparable to cirrhosis of the liver. By degrees the tissues become sclerosed and the vessels undergo endarteritis obliterans, while the acini become atrophied and disappear. As these changes progress the function of the gland diminishes.

The parathyroids are normal. The hypophysis cerebri is atrophied in some cases and hypertrophied in others. The brain shows no gross abnormality. The genitals are infantile in character. The skin is thick, with a scanty development of hair and sweat-glands. The adipose tissue is very abundant, both beneath the skin and in the omentum; often there are pads of fat above the clavicles. The entire osseous system shows a lack of development and ossification.

Symptoms.—When very young—under one year of age—the children are dull and mentally inactive; they are passive, and show little or no interest in their surroundings; they resist manipulations, such as dressing, bathing, and physical examination, but little, if at all. The extremities usually are cool, oftentimes slightly moist.

The general appearance is characteristic (see Fig. 110), regardless of the child's age. The hair is dry and coarse; the face is broad; the nose wide and flat, and the lips are broad and thick. The tongue protrudes between the lips. The tissues have a doughy, edematous appearance and feel boggy to the touch, but do not pit. The forehead is low. The abdomen is usually large, and there is almost invariably an umbilical hernia. The neck is short and thick. The hands and feet are large; the fingers and toes are short and thick. The patients are very short in stature. (The child shown in Fig. 111 was but 26 inches tall when three years of age.) The fontanel is widely open. Dentition is greatly delayed. The temperature is usually subnormal.

The cretin walks late, rarely, if untreated, before the third year. Fig. 110 represents a cretin four years old who cannot stand without assistance. He is 31½ inches tall. Mentally and physically such individuals are slow and inactive. The mental impairment is considerable, idiocy being the outcome in most of the untreated cases.

Acquired Cretinism.—In some, early development is fairly normal and the unmistakable signs do not appear until the child is several months of age.

Illustrative Case.—A girl, three and one-half years of age, with delayed or acquired cretinism, was brought to me from another city. The child was perfectly normal until the third year of age. She then became inactive and took no interest in her surroundings. The hair became coarse and dry, the extremities cool. The expression was dull and listless. The child presented a general edematous appearance. The diagnosis of cretinism was proved by a prompt response to thyroid medication.

Diagnosis.—The diagnosis in typical cases is without difficulty. The nature of the trouble is stamped on every feature. The slow mental responses and the dwarfed, edematous extremities furnish a picture that is simulated by but one other condition, and this is Mongolian idiocy.

In the Mongolian the round face, the elliptic eye, and the absence of shortening in the long bones are sufficient to establish a differentiation.

Prognosis.—The prognosis for a complete recovery is good if the case is discovered before the eighth month. I have several patients under treatment who are apparently normal children when judged by school and family standards. No one knows that these children are cretins. In those in whom treatment is not begun until after the first year—surely after the eighteenth month—the chances of normal mentality are lessened. The earlier the case comes under treatment, the better the possibilities for the patient, both physically and mentally.

Treatment.—*The Thyroid Treatment.*—The specific treatment is the thyroid treatment. The most pronouncedly beneficial results of this treatment are noticed when it is brought into use early in life. The diagnosis of cretinism is rarely made before the fifth or sixth month, often much later, for the reason that the case does not happen to come under the observation of those competent to make the diagnosis.

Fig. 113.—Cretin, aged six months, before beginning thyroid treatment.

Illustrative Cases.—In two cases the patients were first seen by me at the fifth and the seventh month respectively. Other cases have been treated in institution and in private work. The two referred to, however, were seen earlier and almost daily for months, consequently there was an excellent opportunity for observing the effects of the thyroid administration. The desiccated thyroid extract of Parke, Davis & Co. was used.

A fairly complete history of the progress of one of the cases is as follows: The beneficial effects were noticed in three days. The first change for the better was observed by the mother, who stated that the child seemed warmer and that less bed-clothing was necessary. The next positive change occurred, according to my records, on the fifth day of treatment. The child's general condition was very much improved. Her extremities were warmer, her color better, and she commenced to use her arms; but what particularly impressed the mother was that less bed-clothing was needed to keep the child warm. At about the seventh day of treatment the patient cried vigorously when disturbed for the purpose of changing the napkin—something which she had never done before. She had previously been stupid and apathetic. The next changes for the better rapidly followed; the patient noticed and appeared interested in her mother, and followed the latter about the room with her eyes, and while previously the child had rarely used her legs and arms except when disturbed, she now began to move them about voluntarily; as the

mother expressed it, "The child had acted as though she were under the influence of some powerful depressing drug whose effects were gradually wearing off." When the child was five and one-half months old, after she had been under treatment for sixteen days, receiving ½ grain of thyroid twice daily, she smiled for the first time. She cut the first tooth at the ninth month, and walked alone at the fourteenth month. She is now taking 5 grains daily, and is apparently normal in every respect. She attends school, and is but one grade below the average school-child of her age, which means that she is in the same grade with other children who are normal.

When the child in whom treatment was commenced at the seventh month was nine months of age, it was found necessary to give ½ grain three times daily. One month later ½ grain was given four times daily. At this time the child could sit up and hold the head erect. The increase in the thyroid extract produced vomiting, and the dosage of ½ grain three times daily was resumed. One year after the commencement of the treatment, when the patient was nineteen months old, 2 grains daily were required.

In both of these infants the protrusion of the tongue was one of the latest symptoms to disappear.

Dosage.—The increase in the thyroid administration must be determined by the condition of the patient. As long as progress is shown in more active and normal mentality, with an increase in the growth of the long bones and a gradual loss of the typical facial and bodily characteristics, it is unwise to increase the dosage of the thyroid. When, however, a period arrives when no progress appears to be made, the daily dosage should gradually be increased by ½ grain. Evidences of overdosage are pallor, prostration, perspiration, and indigestion. When any of the above signs present themselves, the medication should be discontinued for twenty-four hours and then resumed with smaller doses.

My cases have varied considerably as to the amount of thyroid required. The dosage used was that taken by those in whom the disease was discovered very early in life. The older the patient when the thyroid medication is begun, the less marked are the beneficial results.

Illustrative Cases.—I have a girl five years of age under treatment at the present time who came under my care two years ago weighing 15 pounds and 3 ounces. She made a marvelous improvement under ½ grain of thyroid twice a day, which in two weeks was increased to ½ grain three times a day. This we were obliged to decrease because of the prostration and perspiration which it appeared to occasion. The dosage of ½ grain three times daily could not be used until she was four years of age. She is now five years old and requires 1 grain three times a day. In this child the most remarkable improvement was noted. (See Figs. 111 and 112.)

The interval of time between the photographs was thirty-four days. Six teeth were cut in three weeks after beginning the treatment, and 14 more were cut during the next six months. The child made corresponding improvement in every other respect.

Another girl patient, now nine years old, and normal in every respect except that her hair is rather coarse, with a tendency to dryness of the scalp, was found to require the following amounts of desiccated thyroid at the various ages:

Six months	1½ grains daily
One year	3½ " "
Two years	5 " "
Three years	8 " "
Four years	8 " "

This patient both walked and talked at fifteen months. In her case, in order to determine what the effects of the withdrawal of the treatment might be, the thyroid was discontinued. This was first attempted when she was two and one-half years of age. The mother was asked to keep close watch in order to detect the slightest

difference in the child's behavior. After three days without thyroid it was noticed that the child became less active and disinclined to play. She was not irritable or cross, but would sit in her little chair the entire day. She had previously been very bright, active, and talkative. A few days later she ceased to talk voluntarily and answered only when spoken to. After an interval of twelve days the thyroid was resumed, and her activity again returned. About one year later a similar trial was attempted with similar results, although the duration of the test was shorter, as the mother, who was a dispensary patient and had had the thyroid furnished her, purchased a bottle of tablets and gave them on her own responsibility. The child, when nine years old, was taking 12 grains daily. She was a normal, healthy schoolgirl, alive to all interests of girlhood, and no one outside the family circle in the village where she resided knew that she was a cretin.

The thyroid must be continued during the life-time of the patient; when it is discontinued, the mental processes soon begin to lag. Indifference to surroundings and aversion to physical effort soon appear, all to disappear again when the thyroid is resumed.

DWARFS

In dwarfism there is an underdevelopment of all parts of the body, both of the skeleton and of the soft parts. It cannot be doubted that this condition is purely dependent upon a congenital tendency, but the same effects can be produced, at least in so far as the inhibition of growth is concerned, by harmful influences exerted during the period of development and growth. Thus one cannot always tell with certainty whether an abnormal bodily growth is dependent upon a congenital tendency or upon pathologic influences during the period of growth.

A *true* dwarf is a person of small stature, not deformed, whose development has proceeded symmetrically and at a normal rate (except as regards extent) in comparison with other races, families of the same race, or members of the same family. According to Sainton, a dwarf should not exceed 59 inches (1.5 meters). His best illustration is the race of pigmies in Central Africa, whose height is about four feet. In them the dwarfing is not due to any pathologic process. Sexual development, epiphyseal union, and ossification take place at the usual time.

Symptomatic infantilism or *dwarfism* is a term used for dwarfism associated with delayed ossification, dentition, and sexual development. It is usually the result of some illness or disturbance of nutrition which interferes with growth. In these cases the body is undeveloped, weak, and slender. Usually there is both mental and physical delay. The common causes are general dystrophies, congenital heart disease, tuberculosis, and syphilis. This condition may also be due to a deficiency of the internal secretions, rickets, spinal caries, and lateral curvature. Another type which is described by Loraine is due to a congenital nondevelopment of the arteries (an angioplasia).

According to Hastings Gilford, true dwarfism (ateleosis) is divided into two groups—asexual and sexual. The subjects are well proportioned, with childish faces and intelligence, irregular and backward teeth, small bones and muscles, and an imperfect sexual system. In the first type the whole body is affected, but the sexual organs are the most backward. The arrest in development may occur at any time of life,

and hence the subjects are not dwarfs. There is usually but one in a family. The body proportions, contour, and intelligence are those of a child, and the testes are commonly undescended. In sexual ateleosis the development is always delayed until puberty. The epiphyses then unite, and the sexual organs mature normally. The child resembles a miniature adult, but retains the physiognomy, proportions, and stature of a child. These patients differ from physiologic dwarfs (pigmies) in the retention of many childish characteristics. Sexual ateleosis is frequently hereditary, and some of the affected individuals may have children with dwarfism of the asexual type, thus suggesting a relationship between the two.

Cretinism and chondrodystrophy are treated under separate headings. The cases are often classed with those of dwarfs, but do not represent true dwarfism. As the subjects are dwarfed in stature only, and in the cretin growth takes place under thyroid therapy if the case is seen early in life.

DIABETES INSIPIDUS

Persistent polyuria—diabetes insipidus—is rare in children. The disease is characterized by extreme thirst and the passage of large quantities of pale urine, the condition continuing for months and years.

Temporary or transient polyuria is of occasional occurrence. There are unusual thirst and the passage of abnormally large amounts of urine, a condition continuing for a few days or a week or two.

Etiology.—The cause of persistent polyuria is but little understood. Cases are on record in which the condition has seemed to be closely associated with brain tumors, hydrocephalus, and trauma. But two cases have come under my observation. In these two no cause could be discovered. Temporary or transient polyuria, under my observation, has always existed in nervous girls of hysteric tendencies. It is most apt to develop near the close of the school year, when the child is considerably reduced or somewhat excited in anticipation of undergoing examinations.

Diagnosis.—Polyuria is to be differentiated from diabetes mellitus by examination of the urine. The absence of sugar determines the diagnosis.

Symptoms.—In both the mild and severe cases there are thirst and the passage of large amounts of urine, the amount of urine ranging from 50 to 100 ounces daily. The specific gravity is low—1002 to 1010. The amount of urea and uric acid excreted varies but little from the normal.

In the two cases of true diabetes insipidus there were a secondary anemia and a moderate degree of malnutrition. One patient was much undersized, and at the age of five and one-half years weighed 30¼ pounds and was 37½ inches high. That the lack of development was due to the polyuria, however, is extremely doubtful.

Treatment.—In the cases of functional nervous origin the cure takes place by a change of environment. When the nervous stress is removed, the symptoms subside.

In the true cases no means of treatment have been of avail in my hands. In the case of the boy referred to, various methods of management have been attempted without success. With a diminution of the fluids taken there is a corresponding reduction in the output. As soon as he is allowed freedom in drinking, the frequency in urination and the polyuria return. Drugs have been of no value.

DIABETES MELLITUS

True diabetes in children is, fortunately, a comparatively rare disease.

Etiology.—The cause of diabetes mellitus is not known. Heredity is supposed to play an important part. In 11 cases in children under nine years of age no etiologic factor could be discovered. My youngest case seen was nine months of age at death. The disease was known to have existed but three weeks. Various theories have been advanced from time to time, but we are still as much in the dark as were our medical forefathers. Heredity is supposed to be a factor. In not one of my cases was there a diabetic association of this form. Among adults, Hebrews are more liable to the disease than others. Jewish children have shown no special tendency thereto.

Pathogenesis and Morbid Anatomy.—In "A Study of the Pathological Anatomy of the Pancreas in 90 Cases of Diabetes Mellitus" published in 1909, R. L. Cecil reviews the work of Opie, von Mering, Minkowski, Sauerbeck, and others, and reports that anatomic lesions of the pancreas occur in more than seven-eighths of all cases. In the cases associated with lesions of this organ the islands of Langerhans were constantly involved in changes ranging from sclerosis and hyaline degeneration to infiltration with leukocytes and hypertrophy, while in some cases these islands were the only portions of the gland involved. In 12 per cent. of the cases investigated no pathologic changes were found, although in half of the 12 per cent. the gland was smaller, or the number of islands less than normal. Three-fourths of the cases presenting no lesions occurred in patients under the age of thirty.

Abt and Strouse have recently reported two cases of traumatic diabetes in children. In one the diabetic symptoms followed a fall on the head. In the other the injuries were associated with only a brief period of unconsciousness, and the chief lesion was a compound fracture of the tibia. Both patients developed persistent glycosuria and other diabetic symptoms, and responded typically to treatment. Other cases might be cited of injuries varying from simple concussion to fracture of the skull, with a subsequent glycosuria or even permanent diabetes. Langstein records a persistent glycosuria in two young infants affected respectively by hydrocephalus and malformation of the brain.

Very recently the subject of experimental diabetes has been investigated by MacLeod. He states that dextrose may appear in the urine as a result of deficient utilization of this carbohydrate by the tissues, because of deficient renal function permitting the escape of sugar normally

present in the blood,* or because of an increased production of dextrose in the liver. To the last of these sources of a hyperglycemia he attaches the greatest importance. The hepatic conversion of the glycogen into dextrose is shown to be influenced by a reflex mechanism operating through the fourth ventricle and the splanchnic nerves. That certain drugs and the carbon dioxid present in the blood in asphyxia may produce hyperglycemia by their effects on these nerve-centers controlling glycogen conversion is considered probable. The influence of secretions from such sources as the pancreas, thyroid, and adrenals, while probably important, is not yet fully understood.

The Urine.—The urine is ordinarily increased in amount, clear, acid, and of high specific gravity—1025 to 1050. The amount of glucose present varies widely, depending on the character of the diet, time of day, and time of meals. During certain periods the sugar may be absent. Acetone, diacetic acid, and beta-oxybutyric acid may be found, depending on the severity of the disease. The first two of these substances are oxidation products of the third, which appears only in severe cases.

Symptoms.—Diabetes mellitus is very constant in its symptomatology in children. An early and never-failing sign is loss of weight without apparent cause. The loss of weight is so pronounced that it is often the first symptom to which the attention is called. Thirst is also an early symptom. It is of a very urgent nature. The child never seems to be satisfied. The thirst is so great that the patient is awakened by it in the night and demands water. Milk or any fluids will be taken, but if a choice is given, water will be selected. Repeatedly I have known patients, if allowed, to drink 5 or 6 pints of water a day.

Frequent urination is always present, large amounts being voided; 100 ounces in twenty-four hours is not uncommonly excreted by quite young children. Enuresis occurs in over half the cases. The skin is dry; perspiration rarely occurs even on the hottest days or when the body is covered with warm clothing. A light brawny desquamation is not infrequently seen.

The child becomes listless. There is disinclination to play, and the interest in childish things flags.

The appetite is usually voracious, the child not at all particular as to the kind of food taken. No matter how carefully the food is selected and prepared, the emaciation continues.

As the case makes its inevitable progress toward dissolution the emaciation progresses and the weakness increases until the patient is confined to bed. If an intercurrent disease, such as bronchopneumonia, does not terminate the illness, the child dies from exhaustion or acetonemia.

Diagnosis.—The presence of diabetes is suggested by loss in weight and strength, in association with a voracious appetite and inordinate thirst and dryness of the skin. An examination of the urine determines the diagnosis. The disease may be confused with persistent polyuria

* Under normal conditions the blood contains about 0.1 to 0.15 per cent. of glucose.

and with chronic interstitial nephritis. Here again the differentiation is made by the urine examination.

Duration of the Disease.—Few cases live longer than a year. The majority of the cases terminate fatally in from three to six months.

Prognosis.—All my cases died within less than a year after the diagnosis was made. True diabetes is a fatal disease in children.

Treatment.—My 10 patients have been treated by limiting the amount of fluid taken, by restricting the diet, and by using the opium derivatives and arsenic to the point of physiologic effect, all without the slightest benefit. Bicarbonate of soda, furthermore, has been given in large dosage. The sugar output was reduced, but the patients showed not even temporary improvement in general condition.

Diet.—The following are permissible articles of diet for a child ill with diabetes: Soup and broths made from meat, fresh and salt fish, shell-fish, occasionally egg, fowl, and game, smoked meats, sweetbread, cheese, spinach, celery, lettuce, cucumbers, cranberries, radishes, string-beans, asparagus, squash, cabbage, egg-plant, tomatoes, onions, turnips, mushrooms, gelatin jellies sweetened with saccharin, butter, cream, olive oil, cod-liver oil, lemon, grape-fruit, sour apples, blackberries, raspberries, watermelon. Nuts of all kinds may be eaten. Only bread and biscuits made from gluten flour should be used. It is impossible to procure a starch-free gluten flour; the flour, however, should not contain more than 20 per cent. of starch.

XVIII. MISCELLANEOUS SUBJECTS

HEREDITY AND ENVIRONMENT

Many of the diseases, crimes, and failures of life are attributed to heredity, as are also vigor of body, attainments, and successes. Heredity and environment are two important determining factors in the life of the child. Both exert their influence over the individual. I had been taught, or in some way conceived the idea, that the influence of heredity was predominant; but as a result of the closest association with developing children, coming into intimate relations with hundreds of them and watching carefully their physical and mental development, the great influence exerted by environment, which often means only opportunity, has been forced upon me. It relegates heredity to the background. That certain diseases, such as syphilis and hemophilia, may be transmitted from parent to child is undisputed; that certain physical states—the so-called constitutional vices—may also be transmitted is indisputable; but that much of natural physical weakness and hereditary tendencies may be overcome by the beneficial influence of environment is now universally acknowledged. Heredity without favorable environment counts for little. Place a child or one of the lower animals, with an ideal heredity, under unfavorable conditions of environment and the favorable heritage counts for little. Feeding, care, and general good management shape physical future much more than does inheritance. In proof of supposed inherited mental traits, the offspring of criminals or drunkards are pointed out as showing how children follow in the footsteps of their fathers and mothers. It must be admitted that here the hereditary influence is bad, but one should remember that the environment has also been very unfavorable.

Mental traits much more than physical conditions are apt to have an influence on the progeny, although here, again, brilliant fathers rarely transmit their higher mental powers to their offspring, as is proved again and again in the professional and business world. Many of the ills laid at the door of heredity are due to errors in early management. In the breeding of animals great stress is laid upon pedigree, and credit is given accordingly. It should be remembered, however, that the stock-raiser appreciates the value of the young of his herds, and they invariably get the care that is best calculated to develop the perfect animal, which is exactly what the majority of the children of the human family do not get. A well-bred animal, treated from birth to maturity as are many children, would cut a sorry figure in the animal world.

Hereditary influences in animals are much more apt to obtain because of the comparatively short period of growth from infancy to maturity. The age of puberty in the lower animals is reached in most instances before the first year. In the human the development is much

slower, supplying a much longer time for the influences of environment to make their impress upon the individual.

CONSANGUINITY

Much has been made of the supposed unfavorable influences exerted upon the offspring by parents closely related by blood. Consanguineous marriages, according to my observation, exert very little influence on the progeny if both the parents are in good health.

Because the parents of animals or children are closely related, it does not follow that the offspring must or will show mental or physical deterioration. If there is a decided family taint or weakness, the tendency toward this weakness would be exaggerated in the offspring. I have known first cousins to marry and have perfectly normal children. In two instances under my observation fathers have impregnated their own daughters and normal children were the outcome. In the animal world the close breeding of brothers and sisters and parent and offspring under my own observation was followed by normal vigorous young animals. Doubtless if this breeding were continued through successive generations the outcome would be disastrous.

TEMPERATURE IN CHILDREN

Normal Temperature.—The question is often asked: What is the normal temperature of a baby or young child of a given age? In order to answer this question from our own observation, a study of the matter was carried out at my suggestion by Dr. H. G. Myers, resident physician at The New York Infant Asylum. This study comprised 59 cases, the ages varying from birth to one year. Only well children were selected for the observation, the majority being breast-fed. The temperatures in each instance were taken by the rectum for four minutes.

It was found that the birth temperature in these infants ranged from 96° to 98° F., exceeding 98° F. in but five cases, when it was between 98° and 99° F. In one it was 94° F. During the twenty-four hours following birth there was a rise in the temperature usually of about one degree. From this time on there was little variation in the temperature, when the child was well, regardless of the age. There would be a variation at different times of the day of a fraction of a degree, the temperature being higher in the evening. Upon looking over the charts upon which the results were chronicled, one is impressed by the uniformity of the temperature, which ranges, within fairly narrow limits, from 98° to 99.2° F.

Instances when the temperature arose to 99.5° F. were occasionally seen, but 100° F. was very unusual. It is not claimed that the temperature of a well child may not reach 100° F.; in fact, there were occasions when it rose to 101° F. and illness could not be proved, and had not the temperature been taken for the purpose above mentioned, no elevation would have been suspected, for when next taken the temperature was normal. In those cases in which a rise was proved to be an early sign of illness the recording of the temperature was discontinued and the

first reading was not included in the observations. In one child a temperature of 103° F. was found. It remained at this point for three hours, when it fell to normal without any other manifestation of trouble. When, however, the thermometer registered over 99.5° F., some cause for the elevation could usually be discovered; though it may have been nothing more than excitement or slight indigestion.

Several years ago I personally made a similar series of observations at the Country Branch of the New York Infant Asylum upon 25 healthy children under eighteen months of age. The temperatures were taken four times a day, the observations extending over an entire week. It was found that in these well children the temperature varied from 98° to 99° F.; and that when it rose daily above 99.5° F., some abnormal condition was always found to explain it.

From these observations upon 74 well children, ranging in age from birth to eighteen months, whose temperatures were taken several hundred times, it would seem that a daily rise above 99.5° F. may be considered abnormal. An occasional rise, however, considerably higher than this, as above mentioned, may occur and does occur in perfectly healthy children, without any special significance.

Fever.—By fever, then, in infants and children we understand an increase above that which is considered the normal body-temperature.

In children, for clinical purposes, the rectal temperature should always be taken. With those under five years of age the mouth observation is unsafe, because the child is apt to bite off the thermometer bulb, and unreliable, because the lips will not remain closed the requisite three or four minutes. The axillary temperature is thoroughly misleading and should never be depended upon. Thermometers should be carefully disinfected with alcohol after using. One-minute thermometers, according to my observations, are often unreliable and should not be used.

Hyperpyrexia.—The highest temperature personally known to the writer was 111° F. This was as high as the thermometer could register. It occurred in a child of ten months who was in a convulsion which was one of the first symptoms of a tuberculous meningitis. The child had been placed by the parents in water at a temperature of 115° F., and had been in the water about ten minutes before the rectal temperature was taken. How much the temperature was due to the illness and how much to the hot water will never be known. The temperature responded promptly to a cold bath. The child never regained consciousness and died of meningitis ten days after the initial convulsion.

Fever as an Indication.—Fever may or may not be an index of the gravity of a disease. Thus we frequently see a temperature ranging from 103° to 105° F. in tonsillitis, acute indigestion, and stomatitis—ailments which respond very quickly to treatment and which present no serious aspects. In typhoid fever, pneumonia, scarlet fever, and diphtheria, however, when the temperature range is above 104° F., it is a symptom of considerable value, as indicating the severity of the infection. It is, therefore, not the fever itself, but the condition back

of and associated with it, which makes it a sign of clinical value. In pneumonia children bear a comparatively high temperature, 104° F., for example, without much discomfort or danger; while in the acute intestinal disorders of summer an equal degree of fever is borne very badly, and if continued is of grave significance. This must be kept in mind in our dealings with fever.

Importance of Hyperpyrexia.—When is a given temperature to be interfered with, is a question which concerns all practitioners. This depends to a great extent upon the cause of the fever and its effects upon the patient. If the fever produces diminished assimilation, loss of sleep, irritability, and restlessness, it will do the child harm by diminishing the normal resistance to disease, and should be relieved whether it is 102° F. or 105° F. Interference is thus dependent not so much upon the height of the temperature as upon its effects upon the patient.

The *methods of relieving fever* are: (1) *Elimination:* This applies particularly to the gastro-enteric tract and the skin. In a majority of the cases of high fever due to acute indigestion, with resulting toxemia, a purgation, a bowel-washing, and a carefully adjusted diet for a day or two secure recovery. We remove the cause of a fever, and the fever subsides. Unfortunately, this means of controlling fever is limited to the gastro-enteric tract. (2) *Diaphoresis*, by which is understood the production of an excessive perspiration, will also relieve high temperature. The most reliable way of bringing this about in a child is by the use of moderately heavy covering and the administration of the tincture of aconite, in doses of one-half to one drop every hour—eight doses in twenty-four hours; or liquor ammonii acetatis, two drams every two hours, for a child one year old. (3) *Hydrotherapy:* By far the most satisfactory means of controlling fever depends upon the local abstraction of heat by means of sponging (p. 746), tub-baths (p. 749), and cool packs (p. 747). (4) *Antipyretic drugs:* Much which borders on the sensational has been written about the harmfulness of antipyretic drugs, particularly the coal-tar products. Used in large and frequent doses, they certainly may do a great deal of damage; under certain conditions, used in small doses and repeated at intervals of from three to six hours, they may be, and often are, of benefit. Aconite and liquor ammonii acetatis are of some value, as above stated, but they are of little value in controlling a very high persistent temperature. The coal-tar products furnish the best antipyretic drugs and may be used with safety, but should be used only when, for any reason, the local abstraction of heat by the application of cold is impossible. In many families there is too little intelligence to make a cold pack either possible or safe. In severe cases of pneumonia and scarlet fever, and in the intestinal diseases, sponging often will not answer. Only a trained nurse or a very intelligent mother should be intrusted with a pack. Moreover, sponging and tub-bathing, if repeated too frequently, particularly during the night, exhaust the child. Spongings or tub-baths are often strenuously objected to by parents as well as by the patient, and if the nurse is one of the family, her sympathy will counterbalance her judgment, and the

result be far from satisfactory. Under such conditions, when the application of cold to the skin is impossible, a combination of phenacetin and caffein, alone or with Dover's powder, has proved effective. The antipyretic treatment of scarlet fever is the same as that of pneumonia or typhoid fever.

My use of antipyretic drugs has been confined almost entirely to the ignorant in private work and to dispensary patients. To a child of one year or under, one grain of phenacetin with ¼ grain of citrate of caffein may be given and repeated at three-hour intervals if the temperature requires it; to a child two years of age 1½ grains of phenacetin and ½ grain of citrate of caffein at three-hour intervals; three years and over, 1½ to 2½ grains of phenacetin with ½ to 1 grain of citrate of caffein, at intervals of from three to six hours. If there is much restlessness and irritability, which is not thus controlled, Dover's powder may be added—¼ grain to each dose, for a child of from three to six months of age; ½ grain between six and twelve months; 1 grain after the age of two years is reached. It is always wise to caution parents as to the use of Dover's powder. They should be told that if the child becomes "heavy" or unusually sleepy, the powders must be discontinued. That phenacetin and citrate of caffein cannot be given in solution is unfortunate. Like all insoluble powders, they are best given in some mucilaginous mixture, such as barley-water or one of the cereal jellies. Fruit-juice or apple-sauce usually answers well. Antipyrin, for the reason that it forms a tasteless mixture with water, succeeds better with some intractable children, and may be used in the same doses as phenacetin, although as an antipyretic the antipyrin is less efficient.

OBSCURE ELEVATIONS OF TEMPERATURE

Perhaps the most annoying cases in pediatric work are those with an elevation of the temperature for which no adequate cause can be discovered. In the section on Normal Temperature certain possible variations are given which I regard as within the limits of health. When these boundaries are passed, when there is a temperature range between 99° and 101° or 102° F., or a temperature persistently at 100° or 101° F. without any apparent cause, and continuing for days and weeks, the medical adviser is not in an enviable situation. Such cases coming to the pediatrist through consultation or otherwise are sometimes easy of solution. At other times, however, the cause of the fever may never be discovered, and the patient eventually gets well, leaving us still in ignorance of the cause.

Active Exercise in Nervous Children.—This is not infrequently the cause of an elevation of the temperature. I have seen several cases of this nature.

A few years ago I saw in consultation a country child three years of age whose temperature every afternoon at one o'clock was 102° F. The child, while not vigorous, showed no signs of illness. He ate well, slept well, and played hard. There was a slow gain in weight. The fever was discovered by the mother, who thought that the child,

who was a blonde, looked flushed every day at about the same time. The temperature by rectum was normal in the morning and normal at night. This condition, to the attending physician's knowledge, had persisted for six weeks before I saw the patient. How long there had been a daily elevation of the temperature above the normal before the mother discovered it we have no means of knowing. The doctor, an excellent practitioner, had suspected, examined the child for, and treated him for, various diseases; the first being malaria, with no response to quinin; then typhoid fever, as by suggestion and constant inquiry the child came to imagine that he must be sick, and complained of languor. The fever continued, however, beyond the usual time allowance for typhoid fever and there were no other symptoms. There was no enlargement of the spleen and the blood had been repeatedly found negative to the Widal reaction. Other possible causes of the fever were also given attention. One day the doctor suggested tuberculosis. This aroused the family and friends and a consultation was the immediate result. In company with the doctor, I saw the child at his home. I found a rather thin boy, three years old. The family history was excellent. There was one other child, six years of age, who was well and a good specimen of robust boyhood. The patient had never had a pulmonary disorder and no disease of the respiratory tract other than slight bronchitis. There was no apparent association of the condition with any intestinal or infectious disease. An exhaustive physical examination failed to reveal any abnormality other than a small umbilical hernia and a slight enlargement of the inguinal and submaxillary glands. The blood was not examined. The child was pale, and doubtless a blood examination would have revealed a mild secondary anemia. The appetite was fairly good; the bowels were reported regular and his stools normal. The child had not been kept in bed, as the family did not consider him very ill. The physical examination being negative, I questioned the mother very closely as to the child's habits of life. I found that he rose at 7 A. M., had breakfast at 7.30, and played with his big brother and two older boys until 1 o'clock, when he had dinner. A glass of milk and a piece of bread and butter were given as a luncheon at 11 A. M. I found that he played very actively, kept up with the older boys, and was unhappy when he was not with them. Attempts had been made without success to entertain him with less strenuous play. It was at midday, sometimes before, sometimes after dinner, that the temperature reached the highest point. It seemed to me that here, probably, was a case of fatigue temperature. I accordingly suggested that the boy be undressed and put to bed at 11.15 A. M. after the light luncheon and be made to rest and sleep if possible. At 1.15 he was to be taken up for dinner, his temperature first being taken. These instructions were faithfully carried out, and this ended the daily rise in temperature. The case was one of an active, nervous child becoming overtired in his attempts to hold his own with older and stronger boys. The patient improved rapidly in his physical condition and is now, after an interval of three years, perfectly well.

Another child, four years of age, was seen in consultation with a New York physician, because of a daily elevation of the temperature ranging from 100° to 102.5° F., which had continued for six weeks. The child was thriving and otherwise perfectly well. No cause for the fever could be discovered in his physical condition. He had a noisy, excitable nurse, who was inclined to exciting games and rough play with the boy. With dismissal of the nurse the fever ceased.

Otitis.—Persistent fever, following the acute catarrhal affections of the upper respiratory tract and the exanthemata, is sometimes explained by a suppurative process in the middle ear, without other symptoms than the fever.

Encysted Empyema.—A small area of encysted empyema may explain a persistent fever following pneumonia. Holt describes a most interesting case of this nature in which there was for over four weeks a temperature range from 100° to 105° F. Autopsy showed a small collection of pus between the diaphragm and the lung.

Periodic Fever.—Not infrequently we see cases which show some of the clinical signs of malaria as regards periodicity in the temperature, but without splenic enlargement or the presence of the malarial organism in the blood. Yet, often, these cases quickly respond to full doses of the bisulphate of quinin.

Typhoid Fever.—Occasionally, a low persistent temperature elevation, obscure for a week or two, proves to be due to a mild typhoid.

Tuberculosis.—An elevation of the temperature is sometimes the first premonitory symptom of tuberculosis. Tuberculosis in a child, however, is usually an active process when it involves the lungs, and can readily be made out. When other parts are involved, such as the bones, glands, skin, or peritoneum, the manifestations are usually sufficiently plain to indicate the condition.

Intestinal Infection.—Intestinal infection of a latent type may be the cause of persistent fever. In a suspected case, in the absence of bowel symptoms, it is well to give a laxative and put the child temporarily on a reduced diet consisting largely of carbohydrates.

Pyelitis.—Pyelitis of mild degree may produce a slight elevation of the temperature which may be difficult of solution. Several specimens of the urine may fail to reveal pus. In doubtful cases the urine should be drawn by a catheter and examined by culture methods.

Unexplained Elevations of Temperature.—I have known children to exhibit an unexplained temperature of from 100° to 101.5° F. for weeks without any other signs of illness. I have employed all the newer diagnostic laboratory methods, and I have seen such patients recover without a diagnosis. Of one thing, however, we may rest assured: If a competent, thorough examination does not reveal the cause of the temperature, we are safe in concluding that there is nothing of very serious nature back of it.

Illustrative Case.—The history of a case of this kind, which gave me no end of trouble and annoyance, may not be without interest.

The patient, an eight-year-old boy, was the only son of a habitually anxious

mother, who had unfortunately learned to use the clinical thermometer. She took her boy's temperature after school one day early in December. She found that the thermometer registered 100.5° F. I was consulted, saw the boy in the evening, took his temperature by mouth, with my own thermometer, and found it 100.8° F., with no other evidence of disease. He was perfectly normal in every other respect. He maintained that he felt well, did not need a doctor, and wished to be let alone to study his lessons. The following morning the temperature was 100° F.; in the evening it was nearly 101° F. For six weeks this temperature range continued, never below 100° F., never higher than 101.2° F. The boy, against my advice, was taken from school. He was put to bed, and a half-dozen consultants saw him without shedding any light on the case. Finally the mother became reconciled to "doing nothing" for her son, and he was taken to a nearby winter resort. I suggested to the father that before leaving town he should "accidentally" drop the thermometer on the hardwood floor and then refuse to have another in the house. This he managed to do, straightway. The boy had an excellent time at the winter resort, played with his sled in the snow, skated on the lake, fell through the ice once and received a thorough wetting, without harm. In three weeks he returned, improved as much as any city child improves from a country outing. His temperature was not taken during these three weeks at the winter resort and has not been taken since, except when there have been evidences of illness. He is now developing along normal lines and is a fair physical specimen for his age.

ANESTHETICS

That the use of anesthetics in children is attended with considerable danger is proved by statistics relating to the subject. That the greatest care and judgment should be exercised in the selection of an anesthetic for a child is readily understood.

Ether and Chloroform.—As a routine anesthetic for the young, ether is preferable because of its safety. The popular belief that chloroform is without danger is an error and not sustained by statistics. There are conditions, however, when ether is contraindicated. In cases in which there is bronchial involvement, ether increases the bronchial secretions and produces a free flow of saliva, which is liable to be aspirated into the lungs. In case of any obstruction to respiration, as in laryngeal diphtheria, retropharyngeal abscess, and enlarged glands which may encroach upon the air-passages, chloroform, and not ether, should be employed. Ether is further contraindicated in scarlet fever or in nephritis. In such cases chloroform is to be selected. Chloroform is to be used also for the sake of convenience, if other conditions allow, in operations about the mouth and the nose. Chloroform is contraindicated in general weakness, exhaustion, collapse, and in anemia. Ether given by the drop method should be used in these cases. Statistics of chloroform anesthesia show a considerable mortality in operations for adenoids and enlarged tonsils. The interference with respiration and the sudden hemorrhage make chloroform dangerous in these operations. In heart disease with imperfect compensation any anesthetic is dangerous, but ether by the drop method is the least dangerous.

Nitrous Oxid Gas.—Nitrous oxid gas, which of late has become very popular, should be used with caution in children under two years of age. Young children are very easily asphyxiated by gas; the younger the child, the greater the danger. Under two years of age, sudden and alarming asphyxia has resulted from its use. It should be used, therefore, very sparingly and the patient watched most carefully for signs of

cyanosis. The use of gas in children usually precedes the administration of ether, as it renders the use of the latter much easier for the patient. It is contraindicated, however, in any condition where dyspnea is present; in fact, in any illness in which respiration is impeded, gas is dangerous. The combination of gas and ether in such cases is not as safe as chloroform, which is to be given in a minimum amount with oxygen as a safeguard.

Danger-signals with Ether:

Marked cyanosis; stertorous breathing; rapid pulse; dilated pupils; short, quick, gasping respiration.

Danger-signals with Chloroform:

Pallor; ashen color; feeble, shallow respirations, gasping in character; dilated pupils and separation of the eyelids; slow, feeble heart action.

Danger-signals During Gas Administration:

Cyanosis; jerking respirations; dilated pupils; convulsive movements of any portion of the body.

Ethyl Chlorid.—The use of ethyl chlorid is in the experimental stage. Statistics show quite a mortality from its use. In case the condition of the patient shows any of the danger-signals, it should temporarily or permanently be discontinued and some other form of anesthetic substituted.

CARCINOMA

Carcinoma in children is of very unusual occurrence. I have never seen a case either in hospital or private work.

Phillipp has collected 390 cases of carcinoma reported in children under fifteen years; among these he found but 87 which were undoubtedly true cancers. To these he adds 6 cases, making 93 cases of cancer in childhood. This report was published in 1907. In 1911 Ribbert stated that no other cases had come under his notice, so that about 103 cases of cancer (real) have been reported in children. Three-fourths of these occurred in older children, between eight and fifteen years of age; only one-fourth prior to eight years.

The incidence of sarcoma for comparison is not given.

OBESITY

Exceedingly fat children will usually be found to be hearty eaters and of inactive habits. Obesity is rarely a serious condition, and ordinarily requires little more than certain restrictions in diet and regularity in exercise. Generally, this is not difficult to obtain, as the patients are usually very anxious to reduce the weight because of the attention they attract and the remarks the condition occasions in public places and among school-fellows.

Treatment.—*Diet.*—In such cases I direct that all fatty foods, including butter and whole milk, be excluded from the diet. Skimmed milk may be given in moderation—not over one pint daily. A portion of this may be used on the cereal, and the remainder as a drink. The

use of sugar, including candy and sweets of all kinds, is to be forbidden. Saccharin dissolved in the milk may be used on the cereal and in making stewed fruits and plain puddings palatable. Green vegetables may be given freely. The evening meal should be very light, consisting usually of broth, a small amount of stale bread, and stewed fruit.

Exercise.—During the warmer months golf, swimming, tennis, horseback exercise, and the bicycle are advised, a definite time, in hours, being prescribed each day for some active physical exercise. During the cold months roller-skating, ice-skating, horseback-riding, out-of-doors when possible and indoors on inclement days, when the means are at hand, together with long walks, should occupy part of the daily life. A schedule should be prescribed and written out for each day, depending somewhat upon the station in life of the patient, not only as regards food but also as regards outdoor exercise. In this way, under an established system of living covering the entire day, there will result, if the family coöperate, a reduction of the obesity with marked improvement in the patient's general condition.

Drugs.—The use of thyroid extract and other drugs for the reduction of weight in children is not to be advised.

During the treatment the child should be weighed regularly, as too pronounced results are not desired.

HEMATOMA OF THE STERNOCLEIDOMASTOID

This condition is the result of trauma which takes place during delivery. The muscle is torn as the result of pulling by forceps or manipulation on the part of the accoucheur in the endeavor to bring down the after-coming head in breech cases.

The injury consists in a rupture of the muscle-fibers and blood-vessels. A tumor forms within the muscle-sheath, which may be small or large, involving the muscle structure in its entire width. There is always an associated contraction of the muscle, which places the head in the wry-neck position, drawn toward the affected side. The tumor is usually located in the lower third of the muscle. I have seen it immediately at the attachment to the clavicle.

The tendency of these cases is toward complete recovery. The tumor is absorbed, but a shorter muscle is sometimes left, which holds the head in the characteristic position.

Treatment.—It has seemed to me, in the observation of a large number of cases, that massage hastened the absorption of the tumor. The massage should be practised for fifteen minutes three times a day. At the same time a moderate stretching of the muscle should be attempted by rotating the head toward the unaffected side and upward. All cases eventually make complete recoveries.

HERNIA AT THE UMBILICUS

Protrusion of the abdominal wall at the umbilicus may be due to an improper development of the blastodermic layers, with non-union (exomphalos, hernia into the umbilical cord); or may result from a true

fetal hernia after the umbilicus is lined with peritoneum, or a hernia occurring after birth through a weak umbilical scar.

Hernia of the Umbilical Cord

Morbid Anatomy.—This condition is a true fetal defect, due to a failure of union of the blastodermic layers, leaving as the anterior wall of the abdominal cavity a membrane covered with amnion externally and with peritoneum internally. Through this weakened parietal wall may occur a protrusion usually the size of a pear or an apple, but which may range from the size of a nut to that of a child's head. The tumor is glistening and transparent, and shows through its walls the contents of the sac. These may include any or all of the abdominal contents, stomach, liver, Meckel's diverticulum, omentum, intestines. Occasionally the child will be born eviscerated from the bursting of such a hernia in labor; and often its occurrence is associated with that of a spina bifida.

The covering of this variety of hernia falls off with the drying up and dropping off of the umbilical cord. The contents are thus exposed. If the defect is small enough, it may granulate and epithelialize; but if this does not happen and operation is not resorted to, peritonitis and death will probably ensue.

Treatment.—Operation offers a means of cure in these cases. Kindt reports 50 cures in a series of 65 operations.

The management, therefore, should not be expectant. In view of the good results of operation, an attempt should be made as soon as possible after birth to close the opening in the abdominal wall either by cutting away the sac in its entirety and suturing the abdominal walls together, or by separating the amnion from the peritoneum, replacing this and its contents into the abdominal cavity, and then suturing the walls.

Congenital Umbilical Hernia

Etiology.—This occurs after the closure of the visceral layers, and is due to pressure within the abdominal cavity and to the comparative weakness of the upper part of the umbilical ring, and to the extension of peritoneum surrounding the umbilical vessels, which, forming a sac, directs the force of the increased intra-abdominal pressure. It may occur through the linea alba, just above the umbilical ring, either alone or in conjunction with hernia at the umbilicus.

Prognosis.—The tumor is usually from ¼ to 1 inch in diameter, and may protrude as much as 1½ inches. There is seldom any discomfort, although when the contents are extruded and reduced, there may be some pain. Danger of strangulation is slight, and the prognosis as regards cure is good. The time required ranges from six months to two years. The younger the child, the quicker the cure.

Treatment.—Treatment consists in retaining the hernia and allowing the opening to close, and is, therefore, entirely mechanical. Operation is rarely necessary. Of 2000 operations for hernia in children under fourteen years of age at the Hospital for Ruptured and Crippled, but

1.3 per cent. were for umbilical hernia. By far the most effective method of treatment is to bring together over the umbilicus (Fig. 114) two folds of skin, so that they meet in the median line and invert the umbilicus. These folds of skin thus form a splint which is retained by a strip of moleskin adhesive plaster 1 or 2 inches wide and sufficiently long to hold fast to the skin—usually about 4 to 6 inches. This method in my hands has proved the most satisfactory and has been followed by the most rapid cures.

The objection to the use of a covered button or any form of pad, many of which have been recommended, is that unless it is very large the pad is apt to make strong pressure upon the abdominal opening, and while keeping the hernia reduced, prevent rapid closure of the ring itself. A pad or button may also interfere with the circulation and thus hinder the nutrition of the muscles and cause the weakness to persist. Umbilical trusses and bandages have been used repeatedly, and all have proved hopeless failures, and for one reason chiefly—the difficulty of

Fig. 114.—Umbilical hernia reduced and adhesive plaster applied.

keeping them in position. Any intelligent mother or nurse can be taught to apply the plaster as suggested above. The child may be bathed with the plaster in position. Ordinarily, it is best to apply a fresh piece every fifth day. Irritation of the subjacent skin sometimes occurs, and if this tendency exists, folds can be made at right angles to those previously made and the plaster applied again at right angles to the folds. By this means the excoriated skin remains uncovered.

INGUINAL HERNIA

Inguinal hernia is of rare occurrence in female infants, but is comparatively frequent in males. It may be present at birth, or develop at a later period. The right side is more frequently involved. Double hernia, however, is not at all infrequent.

Etiology.—*Anatomic Conditions.*—The special anatomic condition predisposing to inguinal hernia in infancy is the short and direct course of the inguinal canal. In the infant the internal abdominal ring is

almost directly behind the external ring, and on practically the same level. Incomplete closure of the inner opening, combined with weakness of the peritoneum in the neighborhood of the ring, thus affords easy egress to the hernia. At the femoral canal, on the contrary, the possible hernial opening is quite adequately protected, owing to the close relationship existing in the child between the anterior superior iliac spine, Poupart's ligament, and the spine of the pubes. Consequently femoral hernia in childhood is rare.

A more direct and exciting cause of hernia is the pressure exerted by the abdominal muscles in crying, particularly from colic, and during paroxysms of whooping-cough.

Diagnosis and Differential Diagnosis.—Inguinal hernia in infants is usually readily reducible, and this fact permits of making the diagnosis positive.

Strangulated inguinal hernia may be confused with hydrocele of the cord, enlarged inguinal glands, and undescended testicle.

In *hydrocele* the tumor is translucent, which may be readily proved by means of the following light test: A piece of dark, stiff paper is rolled in tube form, so that the orifice is ½ inch in diameter. One end of the paper tube is placed over the tumor, which is supported while a lighted candle is placed underneath. The observer's eye is now applied to the other end of the tube. If the light is not transmitted through the mass, hernia in all probability is present.

Further, if strangulated hernia has persisted for even a few hours, there will be vomiting and pronounced abdominal distention.

In the condition known as *undescended testicle* the testicle is absent from the scrotum and may be demonstrated in the canal as a small, ovoid, movable mass. In three instances I have known of the wearing of a truss over an undescended testicle.

When due to *enlarged inguinal glands*, the tumor is placed to the left or right of the canal. It is firm, hard, and fixed, and usually more than one gland is involved. It would seem that there should be no necessity for confusion in the differentiation of a gland mass. Nevertheless, I have known errors to have been made.

Prognosis.—The prognosis for cure of uncomplicated hernia without operative procedure is good. At least 98 per cent. of my cases are cured in from six months to one year, through the use of suitable appliances.

Treatment.—The treatment of inguinal hernia in infants and young children is by mechanical appliances or by operation. In infants under one year of age operation is rarely required. The most satisfactory means in my hands for treating inguinal hernia has been the Hood frame truss, made of hard rubber. Measurement for the truss is taken around the hips on a plane with the hernia. The truss, if placed in hot water for a few seconds, or warmed slightly before a fire, can readily be bent, so as to fit the patient comfortably. When the truss is removed for the purpose of cleansing, which should be done twice a day, a helper should be at hand to maintain support at the ring, so that there shall be no descent of the hernia. One descent may mean that several weeks'

care has been brought to naught. The child should wear the truss day and night. The skin, where subject to pressure, should be kept well powdered when the truss is first applied, and the child is often made more comfortable by placing absorbent cotton beneath the hard-rubber pad.

As the child grows the truss will have to be changed frequently. Its use should be continued for at least six months after the last descent of the hernia. Operation is required when the hernia becomes strangulated, and this procedure is always to be advised for older children if a cure is not effected after two years' treatment by a truss. Many of my cases have entirely recovered in less than six months. The use of the truss, in such instances, however, is continued with a view to protecting the parts and preventing a recurrence of the hernia under stress.

VENTRAL HERNIA

This form of hernia is of congenital origin, and is only occasionally seen in infants. It may be associated with umbilical hernia or it may occur independently. It may be due to a failure of the recti to unite in the median line, or it may be due to weakness or imperfect development of the fibers of either muscle.

There is rarely any great protrusion of the abdominal contents, as in the other forms of hernia. Usually a ventral hernia manifests itself in a fullness or distinctly localized elevation of the skin over the site of the absent or weakened muscle tissue in the abdominal walls. The usual location is in the hypochondrium. I have seen from two to three hernias in one subject in this locality. In one case the hernia was in the right lumbar region. Not all cases require treatment.

Treatment.—The application of a four-inch strip of zinc oxid adhesive plaster 2 or 3 inches wide, placed flat on the skin over the hernia, is all that will usually be required. The support thus furnished must be continued for several months. Operation may sometimes be necessary, but has not been required in my cases.

Diaphragmatic Hernia.—These cases are very unusual. Only one has come under my observation. In this case, as in others reported, the defect was located at the left anterior border of the diaphragm. This allowed the intestines to pass into the pulmonary cavity, displacing the heart and the lungs. As may be imagined, the physical chest signs thus produced are most unusual and puzzling.

DIAGNOSIS IN BONE AND JOINT DISEASES

It is not within the province of this book to enter the domain of orthopedic surgery. The practitioner, however, is the first to see cases of illness regardless of their nature, and bone and joint diseases are no exception to the rule. For this reason these diseases will be considered largely from the standpoint of diagnosis. In the examination for bone and joint diseases in runabout and older children the patient should invariably be stripped. He should then be encouraged to move about, to run and play, to sit down, to lie down, to roll over on his stomach and

back again. He may be asked to pick up toys, to walk up and down stairs, to climb into a chair. By these means limitation of motion, a most valuable symptom in joint disease, is made apparent.

Acute Peri-arthritis.—In infants and young children observed in hospital work an infection of the peri-articular structures is not at all uncommon. The symptoms presented are those of superficial swelling, and at times redness and pain upon manipulation. Fluctuation will be present if the case is at all advanced. In my cases the shoulder- and elbow-joints have been the more frequently involved. The disease may be due to any of the pathogenic organisms. In a recent case an examination of the pus showed pure influenza bacillus infection. The gonococcus may produce either a peri-arthritis or an arthritis. Elevation of temperature is an inconstant symptom. It may be present or absent.

Arthritis.—In arthritis the symptoms are usually more urgent. The temperature is higher, 102° to 104° F., and there is complete loss of power in the limb involved, associated with pain, swelling, and redness. As in peri-arthritis, any one of the pyogenic organisms may be the infecting agent.

Gonorrheal Arthritis.—In gonorrheal arthritis the lesion is apt to be multiple. I have seen as many as five joints involved in one patient. The small joints of the hands are particularly apt to be involved in infants with gonorrheal arthritis. Arthritis and peri-arthritis are often confused with rheumatism. In the non-gonorrheal cases the urgency of the constitutional symptoms and the severe local lesion, with the rapid development of pus, renders a diagnosis fairly simple. In gonorrheal arthritis one may have to look to the age as a point in differentiation. Children under eighteen months rarely have rheumatism, and in the very young, successive, severe, inflammatory joint infections should always arouse the suspicion of an infectious arthritis.

Joint Tuberculosis.—While tuberculosis may develop in any bony structure, that form with which we are particularly concerned in diagnosis affects the hip and spine.

Tuberculosis of the Spine.—Tuberculosis of the spine may occur in quite young infants. My youngest patient was nine months of age. While the symptoms vary somewhat, depending upon the location of the inflammation, one symptom is almost always present early in the illness—stiffness, a tendency to hold the body rigid. The child moves awkwardly. If the cervical vertebræ are involved, the head will be held fixed on the shoulders, often with a bearing slightly either to the right or the left, resembling the attitude of torticollis. If the dorsal or lumbar vertebræ are involved, the child holds the body erect and all movements are made with care and caution. The shoulders are thrown backward, the child assuming a military attitude. Bending the body is difficult. When the child attempts to pick an object from the floor, the spine is held rigid, while extreme flexion takes place in the knees in order to bring the hand to the floor. Pain reflected anteriorly may be present, not always early in the case.

In every motion the child attempts to protect the sensitive spine,

making all voluntary motions with precision and apparent forethought.

Early in the disease there is no deformity. The first objective sign to appear is a projection or undue prominence of one or more of the spinal processes. After the development of the angular bony deformity the disease is unmistakable.

Tuberculous Disease of the Hip.—The first symptom of hip disease is a slight limp, due to spasticity of the hip muscles, which causes the child to step short. The onset of the disease is very gradual, and the limping may disappear for weeks at a time and return again, and again disappear.

Illustrative Case.—A boy twelve years old who came under my care had a periodic limp or short step for six years; he had been treated for various conditions, particularly for rheumatism. I referred him to an orthopedist, who, after several weeks of observation assisted by an *x*-ray, pronounced the condition tuberculous.

A shortening of the gluteal fold and a general flattening of the hip with an increased prominence of the trochanter are characteristic of hip disease.

The tendency to spasticity of the hip muscles furnishes a most valuable diagnostic aid. There is a general limitation of motion as compared with that of the sound side: abduction, adduction, flexion, extension, and rotation are all retarded. The joint appears fixed. Tilting of the pelvis, due to the muscular spasticity, consists in an elevation of the patient's back from the table when the extended leg of the affected side rests fully upon the table. In more advanced cases there is the eversion of the foot.

Outward rotation of the entire limb and apparent lengthening, pain, inability to walk, and abscess are the outcome in cases unsuccessfully treated.

XIX. SUGGESTIONS IN MANAGEMENT

VACCINATION

Every infant in fair health should be vaccinated. The vaccination should be done as soon as the child is thriving on a rational diet. The younger the child at the time of vaccination, the less the constitutional disturbance. In well infants, vaccination should never be delayed beyond the fifth month.

The Site.—The site selected for the vaccination in boys is usually on the left arm, at about the point of insertion of the deltoid, and in girls on the outer aspect of the calf of the leg. I have found, however, that it is a matter of much more convenience to the mother in dressing and handling the child if the leg is selected in both sexes. The dressing is more easily applied to the wound and can more readily be kept in place on the leg. Further, in the manipulation necessary in dressing and undressing, much less discomfort is occasioned when the sore is on the leg.

The Method.—Before scarification of the skin, the site selected should be well scrubbed with common soap and water, dried, and then washed with alcohol. The area of scarification should not be over one-quarter of an inch in diameter, and should be sufficient to produce only a light flow of serum. A deep scarification, producing a free flow of blood, is very apt to be unsuccessful. The best scarifier is an ordinary sewing-needle, which should be sterilized by placing the point for a few seconds in an alcohol flame. The virus which is furnished in hermetically sealed capillary glass tubes is the safest to use. The drop of virus is to be deposited on the abraded surface and rubbed well into the wound, using the side of the needle for this purpose. When the wound is thoroughly dried, a protective dressing should be applied. The safest and most convenient is a sterile gauze bandage, which is wrapped several times around the arm or leg and secured with a safety-pin. On account of the shape and position of the parts, the bandage is very apt to become displaced downward. In order to prevent this, a strip of adhesive plaster one inch wide and five or six inches long may be placed over the bandage at right angles to it; the middle portion of the plaster readily adheres to the bandage, and the two ends, at least two inches long, are anchored to the skin.

The After-treatment.—The mother should be instructed to report seven days after the vaccination. On the seventh day the dressing may be removed, and if the vaccination is successful, the characteristic pearl-like vesicle will be present. If, on account of accident or rubbing of the parts by the patient, the vesicle is broken, the non-adhering gauze should be carefully cut away around the sore, allowing that which adheres to remain. Under no conditions should the wound be opened.

Again, a gauze dressing should be applied and kept in position by adhesive strips. At the end of the exudative stage, usually about five or six days, the dressing should again be changed, either by the mother or the physician, and renewed until the crust falls, the third to the fourth week after the vaccination.

If there is no sign of the vesicle in ten or twelve days, the vaccination, if primary, should be repeated. Revaccination should be practised at least once in five years, and at more frequent intervals during epidemics of smallpox.

Complications.—If vaccination is properly performed, the dangers attending it are practically *nil*. That death and serious results have followed vaccination is no argument against its use, but a grave reflection on the manner in which, as a rule, it is performed. The scarification of bacteria-laden skin, producing at the outset an open wound which is indifferently or not at all protected from further infection, is very apt to produce complications of a troublesome and often serious nature. Erysipelas, extensive cellulitis, and sloughing of the parts as the result of careless vaccination are not infrequently seen at out-patient departments for children. In two cases I have seen reinoculation, as the result of scratching the sore, the virus being transferred in one case to the upper lip and in the other to the upper eyelid.

Vaccination Shield.—There is not a vaccination shield on the market, with which I am familiar, that is safe for use. Some cause a maceration of the wound, others allow a free entrance of bacteria, while still others prevent a free superficial circulation of the blood and increase the chance of ulceration. Moreover, the shields are very apt to become displaced, causing a rupture of the vesicle, with resulting infection.

Constitutional Disturbance.—A certain degree of constitutional disturbance is present in every case in which the vaccination is successful. After the first month, however, the younger the child, the less the constitutional disturbance. Children vaccinated during the second or third month suffer practically no inconvenience. There is a rise in temperature—from 100° to 101° F.—for a day or two, and when the process is at its height, perhaps a slight degree of restlessness. Time and again I have seen children, vaccinated at this age, pass through the various stages without manifesting the slightest discomfort. In older children the severity of the constitutional symptoms appears to increase with the age. Thus, a child in the second or third year may have fever, 102° to 104° F., loss of appetite, coated tongue, and moderate prostration. Very active symptoms rarely last longer than three days unless there is considerable accompanying cellulitis.

Local Applications.—Active treatment, except for relief of the immediate constitutional symptoms, is rarely required. Even when there is an active cellulitis I have found it advisable not to attempt local applications, such as lotions or compresses. All ointments have a tendency to dissolve and loosen the crust, producing an open wound. When, on account of suppuration, the crust falls, leaving a deep ulcer formed by granulation tissue, active local treatment will be required.

Such ulcers are often seen in out-patient work. A wet dressing of a saturated solution of boric acid has answered well in these cases. If the wet dressing cannot be kept properly applied, a 10 per cent. ointment of boric acid, applied twice a day, will be found of considerable service in hastening the closure of the wound. The ointment should be smeared freely on gauze or clean linen and held in position by a properly applied bandage. In young children the ulcers are often most obstinate. In a few instances I have known them to continue from eight to ten weeks. In cases in which the healing has been particularly slow, the familiar dressing of balsam of Peru (5 per cent.) in castor oil, applied twice daily on a pad of several thicknesses of gauze and covered with oiled silk, has appeared to hasten the granulation. Unhealthy granulations may have to be cureted before the dressing is applied.

DAYS TO GO OUT-OF-DOORS; INDOOR AIRING

Physicians are frequently consulted as to the age when, and the conditions under which, it is permissible to take the baby out-of-doors. To answer this, the place in which the child lives, the season of the year, and the age and condition of the patient must be taken into consideration.

A child, regardless of the age, should never be taken out in inclement weather. If under one year, he should not go out if the temperature is below 20° F. During the midday heat of summer the baby is better off in the largest and coolest room in the house or on a shady veranda. On very windy days the young infant should not go out; neither should he go out when the snow is melting in large quantities. When going out, on account of unfavorable conditions of the weather, is prevented, there should, however, be no lack of fresh air—the child should be given an *indoor* airing, dressed as for the daily outing. All the windows of the nursery or some other large, sunny room should be opened on one side of the room only. The doors should be closed, so that currents of air are avoided. The child should then be placed in his carriage, suitably covered, and left in the open room all day, except when he is fed and "changed." Here he receives all that is good from outdoors and avoids much that is objectionable outside, in the forms of dust and moisture.

This method will be found very useful in caring for "winter babies"—those born during the late fall or winter months. The indoor airing may be given for a week or more, before the infant is taken out. By this means the child may be gradually accustomed to a change of temperature from that of the average living-room to that out-of-doors, and will not be harmed when finally taken out. After an illness, furthermore, indoor airing will afford an earlier means of returning to the daily outing. This indoor method of giving a child fresh air will be found useful with very delicate children also, who, by reason of their condition, may be unable to go out during the winter months, for several weeks at a time. Few days during the winter are too cold or too stormy for the indoor airing.

INSTRUCTIONS FOR THE SUMMER

In addition to advising parents as to a selection of a summer resort for the family, I advise the mother as to the particular care of the child during the summer, whether he is to remain in town or go to the country. During the months preceding the heated term every mother whose infant is under my care, whether in dispensary or private practice, is made aware of the dangers of the next few months, and means are suggested, and written directions are given, as to how to pass through the summer with the greatest security.

Selection of Milk.—The mother is told what market milks are the best. She is told that the milk must be kept on ice, with ice surrounding the bottle, from the time of its delivery until it is given to the child, except, of course, during the time spent in its special preparation.

Reduction of Food Strength.—During the hot months in the city the child's digestive capacity is not equal to that of the colder months. Children who remain in the city are given weaker milk mixtures, in which the fat and proteid are reduced from 15 to 25 per cent., the sugar remaining the same. The infant may not gain very much in weight, but on a reduced diet he is much more apt to pass through the summer without intestinal disorders, and there is abundant opportunity for him to gain later on.

Clothing.—Mothers are instructed as to the amount of clothing required. They are told that a napkin, a muslin slip, a loose-mesh knitted band, are all that are required on very hot days.

Water to Drink.—Bathing.—They are instructed to give the infant frequent drinks of boiled water between feedings, and if he suffers much from the heat, as shown by prickly heat and restlessness, to give him two or three spongings daily with a cool solution of bicarbonate of soda, one teaspoonful to a pint of water.

Withdrawal of Milk.—It is made very plain that vomiting or a green, undigested stool is a danger-signal which always means that the milk must be withheld for twenty-four hours or longer whether the child is nursed or bottle-fed, and that either barley-water or one of the other carbohydrate gruels (p. 104) must be substituted until such time as the stools improve or the vomiting ceases. This is one of the most important life-saving measures the physician can teach the mother. An immense majority of the intestinal diseases of summer, which destroy thousands of lives yearly, have their origin in a neglected acute indigestion and diarrhea, which if properly managed means a slight illness of but a day or two. It is further impressed upon the mothers that upon resuming milk diet it must be given at first greatly reduced in strength, and then gradually increased until food of the previous strength is given. Beginning with one-half ounce of skimmed milk in each feeding, by watching effects upon the temperature and the stools, an increase of perhaps one-half ounce may be made each day.

How to Obtain Safe Milk.—I have experienced not a little trouble in the past in securing safe milk for infants who were removed at a

considerable distance from the depots of the better class of dairies that supply certified milk. The average farmer is notoriously careless in the handling of milk, and in the country districts, where the milk-supply should be the best, it is often as bad as can well be imagined. In remote country districts, where the milk is furnished by the farmer, a special arrangement is made, by which he agrees that the cow's belly, udders, and teats shall be wiped off with a damp cloth before milking; that the milker's hands shall be washed before milking; that the few jets of the foremilk shall be thrown away; and that as soon as the milk is drawn it shall be strained through absorbent cotton into a quart milk bottle, suitably corked, and placed in a pail of cracked ice. The cracked ice and the absorbent cotton are, of course, furnished by the consumer. For the extra trouble the farmer receives from 12 to 20 cents a quart for the milk. At one resort three babies were supplied in this way, by one small producer, with a comparatively safe milk. The improved milk-pail (Fig. 6) insures a much cleaner milk, as it offers much less opportunity for droppings to fall into it during the milking than does the old-style pail. (See Fig. 7.)

For those who have country homes and who can control their milk-supply the above precautions may be carried out to the letter. By such careful control of the home product, and by the use of milk from those dairies only which observe the above precautions, the acute digestive disorders of summer among my patients are rendered very unusual. These precautions, with the knowledge of the mother or nurse as to what to do at the first sign of a digestive disorder, will reduce the number of the so-called summer diarrhea cases to a very insignificant figure.

Among out-patients in large cities who have to use other milk and milk less clean, summer diarrhea must prevail. Among these, however, the death-rate may be remarkably reduced through the education of the mothers. At the out-patient department at the Babies' Hospital dispensary, where there is a clientèle of fairly intelligent mothers who have been coming to us for years, there is a very low death-rate from summer diarrhea. By pamphlets of instructions as given below, and by showing these mothers that we have a personal interest in their children, we gain their confidence. They believe what we tell them, and, as a result, we repeatedly have children brought to us well along the road to recovery.

For example, a child had developed diarrhea; he had been given a dose of castor oil, his milk was stopped and barley-water or rice-water given.

The mothers are further told that it is never a good thing for a baby to have diarrhea; that a diarrhea is never without dangers; that an infant who has frequent attacks of indigestion during the cooler months is very sure to develop diarrhea during the hot months, and that the safest means of keeping a baby well in the summer is to keep him well all the year round.

Rules for the Care of Dispensary Infants and Young Children During the Summer

1. *Clothing.*—During the very hot days the baby should wear a napkin, a thin gauze shirt, and a thin muslin slip. An abdominal binder made of thin material, and loosely applied, may be worn until the child is six months of age. After this age the binder is not necessary.

2. *Bathing.*—Every child should have one tub-bath daily. On very warm days from two to four ten-minute spongings with cool soda water (one teaspoonful of bicarbonate of soda to a pint of water) will greatly add to the child's comfort.

3. *Fresh Air.*—Fresh air is of vital importance. Leave the windows open. Keep the child in the open air when possible. Avoid the sun. Select the shady side of the street and the shade in the parks.

4. *Sleep.*—Sleep is very necessary for growing children. A noon-day nap of at least two hours should be insisted upon until the child is four years of age.

5. *Soiled Napkins.*—Soiled napkins should be placed in some covered receptacle containing water, and washed at the earliest opportunity.

6. *Drinking-water.*—Boil one quart of water every morning. Put it into a clean bottle. Keep the bottle in a cool place. Give the water between the feedings—as much as the child will take.

7. *Breast-feeding.*—The mother should wash the nipple with plain cold water before each nursing. She should be very careful as to her diet and habits of life. Her bowels should move once a day. Constipation in the mother produces illness in the child. She should have three plain, well-cooked meals daily, consisting largely of milk, meat, vegetables, and cereals. Beer and tea are often harmful. A large quantity, a couple of pints or more daily of either, is positively objectionable.

From birth to the third month: The baby should be nursed at two and one-half hour intervals during the day. Nine nursings in twenty-four hours, with only one nursing between 10.30 P. M. and 6 A. M.

Third to sixth month: The nursings should be at three-hour intervals during the day; 7 nursings in twenty-four hours, with one night nursing.

Sixth to ninth month: The child now takes a larger quantity at each feeding and the night nursing is not necessary. He should be nursed at three to three and one-half hour intervals; 6 nursings in twenty-four hours.

Ninth to twelfth month: The nursings should be at three and one-half to four-hour intervals; 5 nursings in twenty-four hours.

8. *Bottle-feeding.*—The bottle should be thoroughly cleansed with borax and hot water (one teaspoonful of borax to a pint of water) and boiled before using. The nipple should be turned inside out, and scrubbed with a brush, using hot borax water. The brush should be used for no other purpose. There should be three or four sets of bottles and nipples. The bottles and nipples should rest in plain boiled water until wanted. Never use grocery milk. Use only bottled milk which is delivered every morning. The milk should be boiled for five minutes

immediately after receiving. The feeding hours are the same as in breast-feeding. Children of the same age vary greatly as to the strength and amount of food required. Food, when prepared, should be poured into a covered glass fruit-jar and kept on the ice. For the average baby the following mixtures will be found useful:

For a child under three months of age: Nine ounces of milk, 27 ounces of boiled water, 4 teaspoonfuls of granulated sugar. Feed from 2 to 4 ounces at two and one-half hour intervals—8 feedings in twenty-four hours.

Third to sixth month: Eighteen ounces of milk, 30 ounces of barley-water, 6 teaspoonfuls of sugar. Feed 4 to 6 ounces at three-hour intervals—7 feedings in twenty-four hours.

Barley-water is prepared by boiling a tablespoonful of Robinson's barley flour or Cereo Co.'s barley flour in one pint of water for twenty minutes; strain and add water to make one pint.

Sixth to ninth month: Twenty-four ounces of milk, 24 ounces of barley-water, 6 teaspoonfuls of granulated sugar. Feed 6 to 8 ounces at three-hour intervals—6 feedings in twenty-four hours.

Ninth to twelfth month: Thirty-eight ounces of milk, 12 ounces of barley-water, 6 teaspoonfuls of granulated sugar. Feed 7 to 9 ounces at three and one-half hour intervals—5 feedings in twenty-four hours.

9. *Condensed Milk.*—When the mother cannot afford to buy bottled milk, when she has no ice-chest or cannot afford to buy ice, she should not attempt cow's-milk feeding. Canned condensed milk should be used as a substitute during the hot months only. The can, when opened, should be kept in the coolest place in the apartment, carefully wrapped in clean white paper. The feeding hours are the same as for fresh cow's milk.

Under three months of age: One-half to 1 teaspoonful condensed milk; barley-water No. 1 (see formulary, p. 104), 2 to 4 ounces.

Third to sixth month: Condensed milk, 1 to 2 teaspoonfuls; barley-water, 4 to 6 ounces.

Sixth to ninth month: Condensed milk, 2 to 3 teaspoonfuls; barley-water, 6 to 8 ounces.

Ninth to twelfth month: Condensed milk, 3 teaspoonfuls; barley-water, 8 to 9 ounces.

10. *Feeding After One Year of Age.*—All children should be weaned at the age of twelve months unless other orders are given by a physician. The bottle-fed, also, at this age require more than milk and cereal water. During the second year children are almost invariably badly fed.

Four meals a day should be given at the same hours every day. The mother will select suitable meals from the following articles: soft-boiled egg; scraped rare beef; strained broth of beef, mutton, or chicken with stale bread broken into it; toast and butter; stale bread and butter; toast and milk; stale bread and milk; oatmeal (cooked three hours) and milk; hominy (cooked three hours) and milk; cornmeal (cooked two hours) and milk; farina (cooked one hour) and milk. The milk used must be boiled during the hot weather.

11. *Summer Diarrhea.*—When the baby has loose, green passages he is sick and needs medical attention. The disease is frequently mild at the beginning. There may be no fever and the child may show no signs of illness other than the diarrhea. Such a baby oftentimes, with milk-feeding continued, becomes dangerously, if not fatally, ill in a very few hours. The simplest cases of vomiting and diarrhea during the summer must never be neglected. A baby sick in this way should be given two teaspoonfuls of castor oil. Stop the milk at once. Give only barley-water or rice-water until the child can be taken to the family physician or to a dispensary. With slight variations the above rules may be made to apply to many outside of the dispensary class.

THE EXERCISE PEN

In another chapter, in speaking of "colds," and how children are exposed to the influences which may bring about what is known as a "cold," the custom of allowing a child to sit on the floor and play at

Fig. 115.—The exercise pen.

all seasons of the year is referred to as a most frequent means of exposure. There is always a current of air near the floor, as one readily discovers by resting his hand on the floor on a cold winter day; further, the floor of the average house is naturally the most unclean part of the dwelling. Here dust gathers and dirt from the street collects as it is brought in on the feet of older members of the family. On this necessarily unclean floor the young child is permitted to spend a considerable portion of his waking hours. It can readily be seen that countless numbers of bacteria may be transferred, through the medium of the hands, from the floor

to the child's mouth. Rugs and pillows, which are sometimes used, while cleaner than the floor, are of little assistance in preventing drafts.

Exercise is very necessary for the child's proper growth and development. He must have an opportunity and place in which to creep, walk, and run. In order that he may have these advantages and not be subjected to unfavorable influences, I have found the exercise pen (Fig. 115) of the greatest service. After being bathed, dressed, and fed, the child is placed in the pen, on a rug or quilt. Toys are given him and the door is closed. He cannot come in contact with the stove, he cannot roll downstairs, and he is in no danger from the rough play of older children. He is given an opportunity for active exercise without a possible chance of injury.

The pen can be made of any size, but the usual size is 4 feet square. It can be made of any light-weight wood, pine generally being used. The legs of the pen should be at least 12 inches long, bringing it well off the floor. The pen is so constructed that it may readily be taken apart and put together again, iron tenon hooks and iron mortices being used to hold the parts together. The floor may be made of any thin material. One-half inch pine boards nailed together, or papier-mâché supported by narrow strips of board, may be used. The floor is supported by strips of board about one-half by two inches, which are fastened to the inner sides of the end-pieces. The pen is best placed in the corner of the nursery or the living-room. Its size may be determined entirely by the size of the room. During warm weather in the country the pen may often be used out-of-doors.

SUMMER RESORTS

Where to take a baby for the hot months of the year is a vexed question which is raised in many city households every year, and it is one concerning which the physician is frequently called upon for advice. Several years of observation of a great many New York city children who have spent the summer out of town have led me to the following conclusions:

First, the most desirable summer outing is to spend the first half of the season at the seashore, the remainder inland, preferably in the mountains.

Second, the next place in order of desirability is inland, preferably the mountains, for the entire summer.

Third, the least desirable is the seashore for the entire summer.

It is not to be understood that many children will not do well if kept at the seashore throughout the hot months. Some, indeed, improve most satisfactorily, but among my own patients I have repeatedly been impressed with the disadvantages of a too prolonged stay at the seashore. If kept there during August, infants are apt to show signs of lassitude, and while not ill, they do not return to the city in the autumn with the vigor, appetite, and general robustness which characterize those from the hills and mountains. It must be remembered that only New York city children are referred to. Children whose home

is a seaport thrive best when given the benefit of a complete change to the dry, invigorating air inland. Children with catarrhal tendencies, bronchitis, or adenoids, before or following operation, and children who have had attacks of rheumatism or who show rheumatic tendencies, should not go to the seashore, wherever their residence. For an inland resort, the mountains, by which we understand an elevation of 1500 to 2000 feet, are not always necessary. The place selected, however, should be at an elevation of at least 600 feet. For cases of chronic bronchitis and rheumatism a soil of sand or gravel is best, and the sleeping-room of the child should always be above the ground floor.

Other points to be considered in connection with the summer outing are the kitchen facilities, which must be ample. Often the larger hotels refuse the right of way to the kitchen. I find that in this respect much more liberty is given in the smaller hotels and boarding-houses. The

Fig. 116.—Small watch in the œsophagus.

proper preparation of the child's food in the cramped quarters of sleeping-rooms is not impossible, but it is often difficult and always objectionable; therefore if a cottage is available, it will be greatly to the child's advantage. Before selecting a home for the summer, the drainage and the source and quality of the milk-supply should receive the most careful attention. Country well-water or spring-water should invariably be boiled before using.

FOREIGN BODIES SWALLOWED

Every practitioner who has to do with children has had occasion to soothe alarmed parents because of unusual substances swallowed by the child. As a rule, the foreign bodies pass readily into the stomach, and in due course of time pass through the natural channels.

Illustrative Cases.—The father of an eighteen-months-old patient lost a diamond-four-leaf clover tie-pin, and the whereabouts of the pin was not known until the child passed it by the bowel.

The patient of a colleague passed an open safety-pin.

The accompanying cut (Fig. 116) demonstrates the possible dangers of swallowing foreign objects. A small watch disappeared from the neck of a girl four years of age. It was assumed that it was swallowed, and the discharges were examined daily. The child took the usual diet without inconvenience, and it was assumed that the watch had passed into the stomach. After five days it was decided to locate the watch or at least determine if it was in the child's digestive tract. An *x*-ray examination located the object as shown. A surprising feature in this case was the passage of the food alongside the watch. Without the *x*-ray the case would probably have been fatal, through the formation of a perforating ulcer of the esophagus. The patient was placed on her back with the head over the side of a table, to put the mouth and esophagus on a plane. By means of a "penny-catcher" Dr. Robert Abbe, with some difficulty, succeeded in removing the watch.

It is surprising what large and apparently dangerous objects will pass through the entire gastro-intestinal tract without harm. The danger lies in the object becoming fastened in some portion of the intestine and thereby producing ulceration and perforation.

Active laxatives should not be employed in treating children who have swallowed foreign substances. Milk, bread-stuffs, and cereal foods that will make a large fecal mass should be given with the hope of carrying along the object. I have seen a small lead-pencil delayed for two weeks and passed without harm.

The *x*-ray should be used, repeatedly if necessary, in all cases in which there is a delay in the passage of swallowed foreign objects.

XX. THERAPEUTIC MEASURES

THERAPEUTICS IN CHILDREN

It has been my object, in this work, to present as clear and detailed a description of the management of the illnesses of infancy and childhood as space would permit, with a view to a better understanding of pediatric therapeutics.

If I were asked what I considered an important requisite for the successful practice of pediatrics, I would answer: The education of the mother. It is impossible to do even fairly good work in treating diseases of children without proper home coöperation. A direction is never followed out as well as when the reason for it is properly understood.

Many of our beneficial results are due to the therapeutic influences of remedies outside of the realm of drugs. Thus, diet, fresh air, cold, heat, massage, electricity, climate—all are important therapeutic agents in the diseases of children. Successful therapy applied to children involves an understanding and a knowledge of detail greater, perhaps, than in any other line of medical work. It not infrequently is an absence of such knowledge on the part of medical men which explains a great deal of the therapeutic doubt existing at the present time. Therapeutic nihilism, as far as pediatrics is concerned, means ignorance and incompetency. The time when the physician can make a diagnosis and cease from interest in the treatment of the case is past. One of two things happens in the absence of interest or ability on the part of the physician. The faith of humanity in curative agents is remarkable, and when the desired end is not reached by the first physician, some other physician is called; and when he fails, the next resort usually is the charlatan and the proprietary and patent medicines.

The prosperity of the irregular schools of various cults and "sciences" supposedly healing in character, and the consumption by the people of millions of dollars' worth of useless proprietary and patent drugs, are to be attributed in a large degree to an indifferent application of therapeutic measures on the part of otherwise well-qualified medical men. A few great teachers of medicine, by precept and example, have done an incalculable amount of harm in their attitude toward therapeutics. Because they were, or are, unable successfully to treat disease, they assume that it cannot be done. Thus, therapeutic doubt, using the term therapeutics in the broad sense, has been in the past boasted of by men considered clever. Text-books on pediatrics are not without fault in encouraging careless practice, with necessarily an absence of favorable results, especially when they state that "treatment is along supportive lines." What constitutes "supportive lines" in a given case? How is the practitioner to know the author's mind? Or, again,

perhaps it is stated that "free stimulation" is necessary. Stimulation how, when, why, and by what means is what must be known, in order to achieve satisfactory results. "Treatment according to the indications of the case" does not help a puzzled physician to any great extent. "Treatment along the same lines as in adults" adds no illumination when a desperately sick child is the patient, and moreover is faulty teaching, for the reason that the treatment in such instances should never be the same as in adults. An infant or young child should never be treated the same as an adult, either by drugs or other measures, unless we wish more thoroughly to convince ourselves of the uselessness of therapeutic measures.

In order to practise therapeutics successfully in children the methods of the physician must be flexible and adaptable. Children vary greatly in their physical and mental equipment much more than do adults. The practice of pediatrics is necessarily difficult, for every case has to be studied from its own standpoint. The physician who invariably treats all his cases alike will never do the highest class of work with children. The man, for example, who feeds all his difficult feeding cases after one rule or pattern will be sure to have some other practitioner get his failures, which will not be few. A source of disappointment to physicians, particularly in the treatment of young infants and children, is in the disorders of nutrition. A tremendous amount of patience is required in dealing with such cases, and the absence of prompt results is one of the difficult features he has to contend with in his relations with the family. There is, further, a distinction to be made as to what constitutes good results. If the infant develops into a strong child, we may chronicle our results as satisfactory even though a year was required before the condition of the patient was satisfactory. To cause a malnutrition baby weighing only eight pounds at six months, with marked milk incapacity, to show rapid growth by any method of artificial feeding is unusual, and our results are good if he gains but little during the first few weeks. Chronic colitis, tardy malnutrition, or nephritis may require months and years for correcting and yet furnish satisfactory results.

In therapeutics in infants and children, particularly as regards the use of drugs, two points are to be kept in mind—the benefit hoped for and the possible harm that may result. A great deal of judgment must be used in the selection of remedies and the means of using them, lest our best intentions result disadvantageously to the patient. Thus, in bronchitis and in bronchopneumonia the ammonium salts are often given in combination with heavy syrups, such as tolu and wild cherry, both possessing little or no value as expectorants, but having the property of interfering seriously with the patient's digestion. Doubtless alcohol used indiscriminately is, on the whole, productive of more harm than benefit, largely through disturbing the digestion. Digitalis, the salicylates, and the potassium and sodium salts are all to be used with judgment as to method and time of administration or they will do more harm than good. A point never to be lost sight of in the treatment of

diseases of children is the desirability of keeping the gastro-enteric tract in the best possible condition. In children there are other factors also that bear upon the case that tend toward good or evil. The most careful diet and the best selected medication are of little value if the patient is overclad, kept in a superheated room with anxious, oftentimes nervously exhausted persons in constant attendance, with the disturbance to the patient which such attendance entails. However, it must be remembered that absence of proper detail and good judgment with resulting failures is no argument against the value of therapeutic measures, although it often furnishes the evidence upon which the argument is based. Much may be accomplished, by means of prophylaxis, in lowering the mortality in children under five years of age. In this the educated mother's aid is invaluable. She will lay aside prejudices and unfavorable family influences when a physician's direction appeals to her reason. Marasmus, malnutrition, and the intestinal diseases of summer, which directly or indirectly are the cause of thousands of deaths yearly, are to a large degree preventable if the right step is taken at the right time, through the early appreciation of danger-signals on the part of both the physician and the mother.

THE THERAPEUTIC VALUE OF CLIMATE

That climate is a valuable therapeutic measure in the treatment of diseases in children is a well-recognized fact. To my mind an important advantage of a change of climate is that it means more air and better air. When patients go to a resort for climatic purposes it is usually at no inconsiderable expense, and they are therefore pretty likely to avail themselves of advantages. The same amount of air oftentimes could be furnished at home if the family coöperation always could be secured. By the use of the window-board, the roof-garden, and the indoor airing we can to a considerable degree make a climate of our own. Nevertheless, in the majority of families the open-air treatment cannot be carried out successfully; therefore the best interests of the patients are secured when they are sent away from home. There are conditions also in which such means as those just mentioned do not apply even if they are carried out. We can give children warm air, and regulate the temperature of the air in the winter; but if they live in any of our coast towns or villages, we cannot give them cool, dry air in summer. Children who can be removed from a large city to the country, inland, for the summer, are invariably benefited, not only as regards their food capacity and the ordinary influences of open-air life, but they acquire also greater powers of resistance, and are thus less liable to attacks from acute intestinal diseases. (See Summer Resorts, p. 738.)

Pneumonia, Pertussis, and Grip.—During the colder months New York city children who are convalescing from pneumonia, pertussis, or any prolonged illness which has greatly reduced them, will make a much more rapid recovery when removed to Lakewood or Atlantic City, where open-air life is more easily secured than at home.

Malnutrition and Digestive Disorders.—Infants and children suf-

fering from chronic digestive disorders, marasmus, and malnutrition, who are given the advantages of climate or open-air methods either in the home (p. 732) or by a change of residence, invariably make a more rapid recovery than do those deprived of good air because of a lack of appreciation of its value, or through fear of the child's taking cold.

Nephritis.—Again, there are diseases in children in which the sudden change of temperature, affecting the peripheral circulation, may be decidedly harmful. Such conditions exist in slow convalescence from acute nephritis, and also in chronic nephritis. These cases require an equable climate, with a permissible outdoor life, such as is furnished during our colder months by Florida and Lower California.

Asthma.—My experiences as to the effects of climate in asthma have been contradictory. As a rule, cold climates and high altitudes, such as are offered by the Adirondacks, increase the asthma, particularly if emphysema is also present. Nevertheless, I have seen patients who were comfortable only when living under such climatic conditions. From November 1st to May 1st the best results have been effected in children by a change of residence from the cold and changeable weather of the Middle and Eastern States to Lower California or Florida. Residence at the seashore has not been helpful to my patients. Older children whose parents can afford it should be sent to a boarding-school, or to some other institution of learning, located where the climate is such as to guarantee freedom from attacks.

Tuberculosis.—The best winter climate for a child with pulmonary tuberculosis is a dry climate with a mild temperature, neither high nor low, but with sunshine in such abundance as to permit a daily outdoor life. Such a climate is found in southern New Mexico and Arizona. These places furnish conditions as near to the ideal as it is possible to approach. The Adirondacks, while furnishing a climate in winter which may be too severe for young children, answer well for those from eight to nine years of age in whom the disease is not far advanced.

The Sanitarium.—The sanitarium treatment is always to be advised if the patient can afford it. Its advantages rest in the fact of the discipline, the diet, the amount of exercise, the sleeping quarters, the clothing —in short, in all the details of the life, every one of which is important. In a sanitarium all these matters are in the hands of those who are skilled in the management of the disease, and who direct each case according to individual needs. Resorts for tuberculosis cases are dangerous because of the possibilities of reinfection through the carelessness of others. In a well-managed sanitarium, however, regulations regarding expectoration and the care of the sputum reduce this danger to a minimum. Sanitariums, however, are available to but few patients. Many have not the means necessary to a change of residence, and many others refuse to allow their children to be separated from them, both of which facts necessitate the home treatment of a great majority of the cases of pulmonary tuberculosis in young children in our larger cities. (See p. 670.)

COUNTERIRRITANTS

The counterirritants which I have found especially useful in pediatrics are mustard, capsicum, turpentine, camphor, chloroform, and iodin.

Counterirritants are useful for two purposes—for the relief of pain and for the effect upon internal inflammation and congestion. Without doubt the diseased conditions in which counterirritation is of most value are the acute affections of the respiratory tract, such as bronchitis, bronchopneumonia, and pleurisy. In acute bronchitis, when the terminal bronchi are involved, when there are cyanosis and rapid respiration,—from 60 to 80 per minute,—keeping the thorax enveloped in a mustard plaster, one part mustard to two of flour, until the skin is well reddened, will often reduce the respirations from 20 to 30 per minute, so that the child, previously tossing and restless, will fall asleep. I have repeatedly been asked by nurses and mothers if the counterirritation could not be applied more frequently because of the apparent relief experienced by the patient. The applications may often be made with advantage at intervals of from four to six hours. They should be sufficiently strong to produce the desired redness of the skin in from five to ten minutes. This will usually be produced by using at first one part of mustard to two of flour. When the skin becomes tender from the repeated applications, but one part of mustard to five or six of the flour may be required. If the plaster is made too weak, it must remain long in contact with the skin, which thereby becomes macerated.

Indications.—*In Acute Inflammations of the Respiratory Tract.*—When the bronchitis is of the asthmatic type, when there is decided bronchial spasm associated with bronchial catarrh, the counterirritation furnishes not a little relief. In this condition the whole thorax should be enveloped. In bronchopneumonia with considerable bronchitis local applications of mustard over the involved areas are to be advised. The pain from pleuritic inflammation occurring independently of, or at the onset of, lobar pneumonia, or developing during bronchopneumonia, may be considerably relieved by counterirritation. Here also the mustard should be used only over the painful area. When the pain is severe, equal parts of mustard and flour may be used for the first application, if carefully watched, for a quick, sharp skin reaction should be produced. We have no evidence that there is any further action than that of a sedative retarding the inflammatory process within. The mother or nurse should always be cautioned to watch the skin under a counterirritant so that a blister shall not be produced.

During the stage of engorgement and congestion of the bronchi, indicated by roughened or sonorous breathing with occasional sibilant râles, brisk counterirritation with mustard, or with camphorated oil and turpentine, appears to hasten the progress of the case toward recovery. That a respiratory disease is ever aborted by these methods, as claimed by some, is exceedingly doubtful. If the turpentine is used with the camphorated oil, the proportion should be one part of turpen-

tine to two parts of the camphorated oil. The mixture should be well shaken before use and applied vigorously with the hand for ten minutes or until a distinct redness of the skin is produced. The mustard or the turpentine should be used in these cases at least three times a day. I know of no condition where it is necessary to blister a child's skin. Capsicum vaselin may be used in the same way and for the same purpose as the camphorated oil and turpentine.

In Colic.—In severe colic a turpentine stupe will often furnish prompt relief, twenty drops of turpentine being mixed with one pint of water at 106° F. Into this a piece of flannel is dipped, then wrung sufficiently dry not to moisten the bed-clothing, and placed over the abdomen. Over this is placed a dry flannel and oiled silk so as to retain the heat and moisture. The application may be renewed, if necessary, every fifteen or twenty minutes.

In Pleurisy and Empyema.—When adhesions exist in empyema and pleurisy, while the pain is not acute, there is an uncomfortable drawing, dragging sensation in the chest which may persist for months. This has been relieved in a few of my cases by the tincture of iodin, U. S. P., painted over the painful parts every third or fourth night.

In Intercostal Neuralgia.—In intercostal neuralgia, not infrequently seen in overworked school-girls, the repeated application, at intervals of three or four days, of tincture of iodin over the point of exit of the involved nerve will often be followed by complete cessation of the pain.

Acute Articular Rheumatism.—For the pain in acute articular rheumatism, chloroform liniment, U. S. P., may be applied to the joint, or, better, the solution of lead and opium, U. S. P., may be applied warm in old linen covered with oiled silk.

COLD SPONGING IN FEVER

Sponging with plain water, with salt water (a teaspoonful of salt to a pint of water), or with alcohol and water (one part alcohol to three parts water) is a means of reducing high temperature, with which every physician should be familiar. Cool sponging at 75° F. to 80° F., plain or medicated, is useful for two purposes: as a sedative and for the reduction of fever. In measles or scarlet fever, although the temperature may not be high, the itching and burning of the skin prevent sleep, and the patient is very uncomfortable, but often, under such conditions, he will fall asleep during a careful sponging. In pneumonia, in typhoid fever, and in the intestinal disorders of summer, my nurses have a standing order to give a cold sponging for fifteen minutes at any time when, in their judgment, it may be indicated, not on account of the fever, but because of the sedative effect upon the patient. A sponging of ten to fifteen minutes three or four times a day with cool water (65° to 75° F.) will greatly help a baby, whether sick or well, to pass successfully through the hot days of summer.

Sponging for fever, while possessing less antipyretic value than do other measures, such as a cold pack, for example, has the advantage in that it is safe and easy of application in the hands of the most un-

skilled, and will be of assistance in influencing high temperature when other means are not available. In order not to antagonize or frighten timid children, it is often wise to begin with the water, whether plain or medicated, at 95° F., and reduce the temperature gradually by the addition of cold water or small pieces of ice. It is rarely necessary to go below 60° F., and usually the sponging should not be continued longer than thirty minutes. It is well to have an interval of rest—from thirty to ninety minutes—between the spongings, as too frequent sponging, if resisted, may exhaust the patient. Every part of the body should be sponged in turn, but it is not necessary to expose the patient, who should be covered with a flannel blanket. When the process is completed, the skin should be briskly rubbed for a few minutes with a dry, rough towel.

THE COOL PACK

The cool pack, properly applied, is free from the slightest danger to the patient, and is the best means we possess with which to combat a continued high fever. The pack may be used as freely and with as much success in treating the exanthemata as in dealing with typhoid fever or pneumonia. That cool water may not safely be applied to the skin of a child with scarlet fever or measles is a fallacy which it is our duty to explain to mothers.

The pack is prepared as follows, a rubber sheet being used to protect the bed-sheet: A large bath-towel, or some thick, soft, absorbent material, should be used. Muslin, linen, or any thin material does not answer so well. Slits are cut in the towel large enough for the arms to pass through, and the towel is folded around the body, enveloping only the trunk and buttocks (Fig. 117). The pack should not extend below the middle of the thighs. This leaves the arms and the greater part of the lower extremities free. A hot-water bag, carefully guarded, should be placed at the feet and the patient covered with a blanket of medium weight. The towel is moistened with water at 95° F. This higher temperature is necessary at first in order not to frighten the patient, as sudden cold is apt to do, and also to avoid shock. In two or three minutes the towel, without being removed, is again moistened with water at 90° F., later with water at 85° F., and still later, at 80° F. When the temperature of the water reaches 80° F., it should be maintained at this point for half an hour, when the patient's temperature should again be taken. If at the beginning his temperature was 105° F. and now shows little or no reduction, the temperature of the water with which the towel is moistened should be reduced to 70° F., or, if necessary, even to 60° F. The child, throughout, need not be disturbed, except to be turned from side to side in order to wet the towel with water of the desired temperature, this being one of the advantages of the pack over a tub-bath or sponging. The towel, or other material employed, should not be used for more than six hours without being replaced by a fresh one.

For the first hour or two in a pack the temperature of the patient

should be taken every half-hour. When it is reduced to 102° F., the pack should be removed, for, if it is continued longer, too great a reduction may take place. If the fever rises again rapidly to 105° F. or higher, it is well to keep the patient in the pack continuously. The degree of cold necessary, in the individual case, to keep the temperature within safe limits will soon be learned. I recently kept in a pack for seventy-two hours a boy four years old with lobar pneumonia. In this case a continuous pack of 70° F. was required to keep the temperature at 104° F. or slightly lower.

Another reason for frequently taking the temperature is that, early in the attack, we do not know how the fever will be affected by the continued cool applications. In some children it is very readily influenced, and in such a case collapse might follow a very sudden reduction of the temperature. In cases readily controlled, the pack may be necessary for only one-half hour or an hour, at intervals of three or four hours. An ice-bag may with advantage be kept at the head when the child is

Fig. 117.—The cool pack.

in the pack. Suddenly enveloping the entire skin surface in a cold sheet at 70° F., as advocated by some writers, may increase the temperature and occasion grave symptoms of impending death, because of the sudden contraction of the superficial blood-vessels, which sends the blood to the viscera, producing congestion of the internal organs.

BATHS

The newly born child should be given, daily, a basin-bath with lukewarm, boiled water and Castile soap until the cord falls and the navel heals. When this has taken place, the tub-bath may be given. The temperature of the bath for the very young infant should not be below 95° F. nor above 100° F. Very young children should not be kept in the water more than three minutes. After the third or fourth month a temperature of 90° to 95° F. is best, the child being kept in the water about five minutes. At this age I prefer to have the tub-bath given at night, just before the child is put to bed. A basin-bath may be given in the morning. When the child is a year old and fairly vigorous, the

temperature of the water at the beginning of the bath should be 90° F. This should gradually be reduced to 80° F. by the addition of cold water, the child being vigorously rubbed with the hand while in the water. The temperature of the room should be from 76° F. to 80° F. during the bath, and windows and doors should be closed. When removed from the tub the baby should be dried quickly and thoroughly, and the folds of the skin should be well powdered. A sponge should never be used in any portion of the bathing process and should never be included in the nursery outfit. It is never clean after it has once been used. Some children have a dread of the bath, and cry frantically when placed in the water. This is due to fear, and may usually be overcome by placing a sheet over the tub and lowering the child on it into the water.

Fig. 118.—Bath thermometer.

The Cold Douche.—For "runabouts" from two to three years old it may not be wise to use water below 70° F., but many children over three years have the water applied in the form of a cold douche after the cleansing bath, during the entire twelve months, at the temperature at which it runs from the faucet. In winter, in New York houses, this ranges from 50° to 60° F.

In giving the cool douche the child should stand in warm water covering the ankles. The douche may be used in the form of a spray or shower, or the water may be applied by means of a sponge moistened with it at the desired temperature. The head, if the shower or spray is used, should be suitably protected by an oilskin or rubber bathing cap.

After the cold douche there should be a vigorous friction of the skin with a rough towel. If there is not a quick reaction, if the skin does not become warm and glowing, warmer water should be used. So also with blueness of the extremities and "goose flesh," water less cold should be used, but the douche should not be discontinued.

In the great majority of homes the bathing of the children can be carried on with greater convenience immediately before their bed-time. The child should receive the warm bath and the cool douche, and then, in night-clothes, a warm wrapper, and suitable foot covering, he should eat his supper. However, if this time is not convenient, he may be given the evening meal at 5.30 or 6.30, followed in one hour by the bath and bed.

Tub-baths for Fever.—Place the child in water at a temperature of 95° F. and reduce to 80° F. or 75° F. by the addition of ice or cold water. The duration of the bath should not be more than ten minutes, constant friction being maintained during the entire process.

Basin Bathing for Fever.—Add eight ounces of alcohol to a quart

of water at a temperature of 70° F. The child is stripped, covered with a flannel blanket, and the entire body sponged with this solution for ten or fifteen minutes. Drying the skin should not be practised. Allow the alcohol and water to evaporate from the body surface, as by this means a greater reduction in the temperature will be effected.

Either the tub-bath or the basin-bath may be used by the mother in case of sudden high fever—104° to 105° F.—before the physician arrives. She should be so instructed.

Bathing for Comfort in Hot Weather.—The basin-bath and tub-bath may also be used as a means of relief during very hot weather. One or two basin-baths a day, with a tub-bath at bed-time during this trying season, will give the child much relief, and help him to pass safely through. The very young feel the extreme heat most acutely, and endure it with difficulty. I know of nothing else that will give a restless, uncomfortable, heat-tormented child such a refreshing sleep as will a cool tub- or basin-bath.

Mustard Bath.—A mustard bath is prepared by adding a heaping tablespoonful of mustard to six gallons of warm water. From five to ten minutes in the bath is all that is advisable to allow. The special use of the mustard bath is in the treatment of convulsions; it will be found useful also for nervous children who sleep badly. Two or three minutes in the mustard water, followed by a quick rubbing immediately before going to bed, are oftentimes all that will be required to induce refreshing sleep.

Brine Bath.—A brine bath—an even tablespoonful of salt to one gallon of water at a temperature of 95° F.—is of great service with very delicate, poorly nourished children. Its action is that of a tonic. If the child is thoroughly soaped and washed with plain water and then immersed in the brine bath, no further tubbing is necessary. The child should be kept in the bath for five or ten minutes, constant friction being continued during the entire time. The brine bath is not applicable to children with intertrigo or eczema, or any condition in which there is an inflammation of the skin.

Soda Bath.—The soda bath is of some service in cases of prickly heat, from which many children suffer during the summer. A tablespoonful of bicarbonate of soda should be added to each half gallon of water used. The temperature of the water should be that to which the child is accustomed. From two to four minutes in the water suffices. There should be little or no friction of the skin. The child should be dried with soft towels.

Bran Bath.—The bran bath also is of service in prickly heat. One cup of bran is mixed with the water in the bath-tub and the same method employed as for the soda bath.

Starch Bath.—The starch bath also is useful in prickly heat. One-half cupful of powdered laundry starch is mixed with the water in the bath-tub, and the same method employed as for the soda bath.

Hot Bath.—The child is placed from three to five minutes in water which has been raised to a temperature of 105° or 110° F. Constant friction of the extremities is maintained during the bath.

BATHING THE SICK

There is a pronounced objection among many to bathing children when ill, particularly when they are suffering from respiratory diseases or from the exanthemata. The functions of the skin as an organ of excretion and elimination are most important, and it is absolutely necessary that, during illness, when the metabolic processes of the body are being carried on to an excessive degree, all the eliminating organs be kept in the best possible condition in order that they may the better do their work. Therefore to perform its functions properly the skin must receive proper attention, and there is no better means of stimulating it to a sharp reaction than bathing with weak salt water—a teaspoonful of salt to a gallon of water—at a temperature of 85° to 90° F., followed by a brisk rubbing. Every sick child should receive a sponge-bath at least once daily. It is the sudden contact of cold air with the moist skin which occurs sometimes in undressing a child, without the attendant reaction, that causes the shock, the "cold," which is usually attributed to the bath. It is the temperature of the room in which the child is undressed, the careless method of bathing, and not the application of water, which cause the trouble. Even the danger of this exposure is greatly overestimated. In order to avoid every possible danger, however, the temperature of the room in which the sick or delicate child is bathed should be raised to 80° F. I have yet to know of a child who suffered from the effects of a bath properly given, and I know of hundreds who have suffered because of its absence.

UNPALATABLE AND NAUSEATING DRUGS

It is impossible to mention in detail all the drugs which might be included under this heading. Only those will be referred to which we are obliged to use almost daily in our work—drugs which are either unpleasant to the taste or which may be badly borne by the stomach, or drugs combining both these disadvantages. How to administer certain drugs so that their use may be continued and yet not interfere with the digestive function is a question which deeply concerns those who may have children for their patients. The element of taste is a most important one to a child; therefore, when possible, drugs disagreeable to the taste should be given to children in tablet or pill form or in capsule. The continued use of a drug oftentimes depends upon its being made palatable. As a general rule, when pills, tablets, or capsules are given, one-half glass of water should be taken at the same time, in order to diminish any possible irritant effects upon the mucous membrane of the stomach.

Salicylate of Soda.—Salicylate of soda is a drug disagreeable in taste and very liable to destroy the appetite and interfere with digestion. In acute rheumatism its use is invaluable, and we are obliged oftentimes to give it in large doses. It is best given after meals with one-half glass of milk. Fairly large doses at this time, well diluted, are better than more frequent smaller doses. This drug usually is better borne

if given in solution with peppermint-water or with simple elixir diluted 50 per cent. with water; but the taste when thus given is only partially disguised, and being still very objectionable to many, may be prevented by the use of a capsule if the patient is old enough, care being taken to give a considerable amount of water or milk with each capsule.

Iodid of Potash.—This drug is indispensable and is one for which no other can be substituted. It is best given in solution. It is most disagreeable in taste and directly irritant to the mucous membrane of the stomach. Like salicylate of soda, it should be given after meals with one-half to one glass of water or milk. It is best given plain, as the saturated solution, which may be dropped into the milk.

Bichlorid of Mercury.—This drug is usually given in such small doses that its irritant properties are but little felt. It is best prescribed in tablet form, dissolved in two teaspoonfuls of water and followed by a swallow of water. When possible, it should be given after feeding.

Alcohol.—Alcohol is another drug which should be given well diluted, regardless of the form in which it is administered. It is best given with or after food, but it should always be given diluted with at least six parts of water, if whisky or brandy is used.

Ipecac and Tartar Emetic.—Ipecac and tartar emetic, when employed as expectorants, are best given with sugar of milk in powder or tablet form. They should never be given on an empty stomach. Two or three teaspoonfuls of water should precede their administration when they are not given within a reasonable time after feeding. In many children, when given without this precaution even in the usual doses, they will often decrease the appetite and the digestive capacity.

The Ammonium Salts.—Carbonate of ammonia must always be given in solution and should always be well diluted with water. Muriate of ammonia may be used in tablet or powder form. Water or milk should precede the administration of either. One part of simple elixir with two parts of water makes an agreeable combination.

Oils.—Oils used for nutritive purposes should invariably be given after meals. Plain cod-liver oil or any of the preparations containing it should never be given on an empty stomach.

Castor Oil.—Castor oil is best given when the stomach is empty. A much more prompt and satisfactory cathartic effect is thus produced. The oil may be given in soda-water or coffee, with orange-juice, or in peppermint-water. Older children sometimes take oil better plain, sandwiched between the two halves of a peppermint cream, first the candy, then the oil, followed by the remainder of the candy. If castor oil is vomited, it may be repeated in a few minutes, and often will then be retained.

Creosote.—Creosote is most difficult of administration to many children. I usually prescribe the carbonate, which is ordered to be dropped into one or two teaspoonfuls of wine after meals. It may also be given in soft capsules or in an emulsion.

Quinin.—Quinin should be given in solution or in capsule. Quinin pills as they are sometimes made, with an insoluble coating, pass un-

changed through the entire intestinal canal. For purposes of solution a most satisfactory menstruum is a preparation of yerba santa, known to the trade as Yerberzine (Lilly). The bisulphate should always be prescribed for children, for the reason that it may be given in complete solution without the addition of acid.

Strychnin.—Strychnin, on account of its taste, is often strenuously objected to, and is therefore better given in tablet triturate form. If the tablet cannot be swallowed, it may be broken into small pieces (not powdered) and mixed with a teaspoonful of orange pulp or in a thick cereal jelly.

Digitalis.—Digitalis, when the tincture or the infusion is used, should never be given when the stomach is empty. It should be administered after meals or the drinking of water or milk. There are few drugs that will so completely destroy a child's desire for food as the digitalis preparations when put into an empty stomach.

Tincture of Muriate of Iron.—The tincture of muriate of iron should be given after meals, well diluted, in at least one-half glass of water. The child should take the medicine through a glass tube so as not to injure the teeth. Iron preparations generally should be given after meals, and in case the liquid preparations are used, they should be well diluted with water.

ALCOHOL

In its relation to children, alcohol, regardless of the form in which it is used, must always be considered as a drug and not as a beverage. It is occasionally of great service in diseases of children. Under certain conditions it answers better than any other means of stimulation we possess. The fact that it is grossly misused does not in any way detract from its value in illness. It is too often given, chiefly for the reason that its use, in the form of whisky and brandy and wine, is advocated in medical works in many of the ordinary ailments of childhood where really it is absolutely contraindicated. Its use, in my hands, has been that of a food and stimulant in very grave conditions, the duration of its usefulness being often completed in a day or two. When given to children for a prolonged period, even in moderate quantities, it invariably interferes with digestion and assimilation, and therefore does harm. It is very liable also to act as an additional irritant to the kidneys, which are prone to show inflammatory changes as a result of the systemic toxemia due to the disease. We have heart stimulants which are ordinarily as effective as alcohol and without its danger either to the stomach or the kidneys.

It is my practice never to give alcohol early in an illness unless the onset is accompanied by profound prostration, but rather to hold this drug in reserve until it is absolutely necessary. Used in this way, it has been of much service in two conditions in which, in my opinion, nothing can replace it. I refer, first, to that time which may arise in any grave disease when the heart fails to respond to the usual stimulation, as in the crisis of lobar pneumonia and in the profound toxemia of

scarlet fever or diphtheria. At such a time the powers of assimilation for most drugs as well as for food are reduced to a minimum. When food is rejected or taken badly, when the usefulness of strychnin, strophanthus, musk, camphor, digitalis, and caffein has been exhausted, alcohol should be given and given in as large doses as may be required to produce the desired results. It is astonishing what large quantities of alcohol may be given without the slightest intoxicating effects in many such conditions. When given well diluted it is usually well borne and assimilated; it supports the heart, improves the respiration, and often will carry the patient through to a successful convalescence even when the outlook is very unpromising. As the system readily becomes accustomed to alcohol, it must be given in increasing doses. If it is begun early in the illness, it will have lost its stimulating effects by the time it is most needed. Brandy or whisky, well diluted, is the form in which it is generally used.

The second condition in which alcohol is useful is in cases with greatly lowered vitality resulting from some severe illness, such as typhoid fever, enterocolitis, or pneumonia. If a child is suffering from shock bordering on collapse, or collapse with a subnormal temperature with all the vital powers at a low ebb, alcohol will do much to sustain him until he is able to assimilate easily digested or predigested foods. In such cases whisky, well diluted,—1 part whisky to 6 parts of water,—given at intervals of two or three hours, will hasten recovery. If the child cannot swallow, the whisky may be given by gavage; if vomited, double the quantity, well diluted, may be given by the rectum. Its hypodermic use is infrequently resorted to chiefly for the reason that other remedies, such as strychnin and digitalis, are more effective than alcohol when so given. The doses vary from 5 drops to ½ dram every one or two hours, 12 to 24 doses in twenty-four hours, for a child one year of age. A child two years of age may be given 1 dram at intervals of one or two hours. The use of alcohol is attended with the least disturbance when it is given after the feedings.

HEAT AS A THERAPEUTIC AGENT

Heat has long been used as a therapeutic measure. For infants and children it has a wide range of usefulness, both as dry heat and when conveyed by the use of water as a vehicle.

Moist Heat.—Heat, water-borne, is used as follows:

In colic and indigestion and as a diuretic, internally.

In acute gastritis, as a sedative, taken by sipping.

In convulsions, idiopathic and uremic, by means of baths.

In convulsions, idiopathic and uremic, as colon flushings, 105° to 110° F.

In colic, as a hot stupe applied to the abdomen.

In torticollis, as a hot compress to the neck.

In sprains, as a hot compress to the joint or muscle.

In acute articular rheumatism, as a hot compress to the joint.

In retention of the urine, as a hot compress applied to the lower abdomen and bladder.

In suppression of the urine (*acute nephritis*), as a poultice or hot compress over the kidneys and in colon flushings, 105° to 110° F.

In cerebrospinal meningitis, as a hot bath or hot compress to the trunk and lower extremities.

In pleurisy, as a hot compress to the painful area.

In acute angina, as a gargle.

In conjunctivitis, as a hot compress.

To hasten suppuration in an abscess, as a poultice or compress.

In retropharyngeal abscess and in peritonsillitis (*quinsy*), as a throat douche.

In earache, as a douche or by means of a hot-water bag.

In toothache, by means of a hot-water bag, or as hot water held in the mouth.

In facial neuralgia, by means of a hot-water bag.

In prematurity and in lowered vitality or reduced temperature after disease, by hot-water bags or bottles.

Dry Heat.—Dry heat is used in the following conditions:

In prematurity, lowered vitality, or reduced temperature after disease, by means of the electrotherm (p. 154).

In suppression of the urine (*acute nephritis*), by the electrotherm or by hot air (p. 435).

In using heat with children caution should be exercised as to the degree employed. Serious burning accidents have occurred by the use of hot-water bottles and hot compresses. When it is used very hot, the hot-water bottle should be guarded by wrapping it in flannel. Moist heat in the form of compresses, poultices, and stupes should always be tested by placing the vehicles against the face of the attendant. The adult hand will often bear a greater degree of heat than is safe to apply to the skin of an infant or young child. In using hot packs, hot-water bags, the electrotherm, or dry heat, generated by a lamp or other device, such as the Kilmer kettle (Fig. 26), a thermometer should be placed between the child's clothing and the bed-clothing. A temperature of 110° F. is the highest to use with children. When water is the vehicle, the patient must be most carefully watched and the application frequently renewed because of the rapid evaporation. A compress or poultice must not be allowed to get cool. A piece of flannel or oiled silk or rubber tissue over a hot compress will obviate the necessity for frequent changes.

COLD AS A THERAPEUTIC AGENT

In the treatment of children, cold is generally used in the form of compresses, baths, or packs, and is indicated in the following conditions:

In tonsillitis, acute pharyngitis, and headache, in the form of a cold compress.

In meningitis and pyrexia, by means of the ice-bag or the cool coil.

In appendicitis, by means of the ice-bag.

In endocarditis and pericarditis, by means of the ice-bag.

In fever, by means of baths, cold packs, sponging, and in older children, by colon flushings. (Not lower than 70° F. when used thus.)

In adenitis and in threatened superficial abscess, by means of an ice-bag.

In hysteric and neurotic children, as a spinal douche.

In malnutrition in older children as a tonic, by means of a moderate cool spinal douche following a warm bath.

For further details as to the application of cold in special diseases the reader is referred to the discussion of the diseases in question.

LAVAGE—STOMACH-WASHING

To Seibert, of New York, is due the credit of first calling attention in this country to the value of stomach-washing. Its use was soon appreciated by pediatricians generally, and at the present time it is an indispensable therapeutic measure with those who are actively engaged in children's hospitals, in out-patient or in private work among children. In the vomiting of children, whether due to an acute gastro-enteric infection, chronic indigestion, or a subacute attack of chronic gastritis, it is equally valuable. The dangers of stomach-washing can be said to be practically *nil.* A colleague a few years ago, while washing the stomach of a child two years of age, turned away for a moment, when suddenly the struggling child disconnected the tube from the glass connecting-rod and swallowed the tube. Attempts at its removal through the bowel were unsuccessful; gastrostomy was performed, the tube removed, and the child recovered. This is the only accident of any kind I have ever known during stomach-washing.

The Operation.—For lavage, the child is easiest handled when its arms are pinned to its sides by a towel passing around the body. It may rest on its back in a crib, or sit upright on the lap of the nurse or mother (Fig. 119). The clean left index-finger of the physician is placed upon the base of the patient's tongue. The tube, moistened with the fluid to be used in the washing, not with oil, is passed down over the base of the tongue into the esophagus. Passage of the tube into the larynx is practically impossible. I have washed the stomachs of many hundred children, and the introduction of the tube has never been attended with difficulty. When it has entered the esophagus, it should be passed rapidly into the stomach. At least nine inches of the tube will be required to reach the lower portion of the stomach. At first the child will cough, retch, and become red in the face, but this need cause no alarm. He will soon cry and begin to breathe regularly. When the tube is in position, the funnel should be held the length of the tube, two and one-half to three feet above the patient's body; the water, which should first be boiled, may then be poured into the funnel. At first the water may remain stationary in the funnel, owing to the pressure of air in the stomach and the straining of the child. When the child

relaxes or the air escapes, being forced upward through the water, the water will pass rapidly into the stomach.

The apparatus described under Gavage (p. 760, Fig. 121) is used. It should always be boiled before using. If much mucus is present, a 1 per cent. solution of boric acid or borax may be used. The amount introduced into the stomach at one time varies with the age of the child. For a baby of one week 1 ounce may be used; at six weeks, 2

Fig. 119.—Lavage.

ounces; at six months, from 4 to 6 ounces. It is rarely advisable to introduce more than 6 ounces at one time. The fluid is allowed to run into the stomach and is then siphoned out by lowering the funnel, the process being repeated until the fluid returns perfectly clear. From one to two pints of water may be necessary to complete the washing.

Indications.—It is rarely necessary to wash the stomach oftener than twice in twenty-four hours. Ordinarily, in the acute vomiting

cases, one washing daily for four or five days will answer. In cases of chronic indigestion with regurgitation the washing will be needed less frequently—once a day, or once every second or third day.

The following is frequently the history of a case of chronic indigestion with vomiting: There has been, for several weeks, vomiting of food and mucus, two or three times daily. The stomach has been washed, the child carefully dieted with a plain barley-water or a weak milk mixture, and no vomiting has occurred for perhaps twelve, twenty-four, thirty-six, or forty-eight hours, when the regurgitation or vomiting again commences as before. In such a case it will soon be learned how frequently the washings should be repeated in order to control the vomiting.

Illustrative Case.—A recent case represents my management: A child six months old suffering from malnutrition had a history of persistent vomiting after each feeding. A greater part of the food taken was lost. What was not vomited was digested imperfectly, as was shown by the stools. The stomach was washed and a large quantity of thick mucus and curds removed. The child was given a barley-water diet. There was no vomiting for three feedings, and then only a small quantity of barley-water was thrown off. After three days, following daily washings, the vomiting entirely subsided. The child was given a weak milk mixture, one-fifth milk and four-fifths barley-water, and no significant vomiting resulted. The food was carefully strengthened, and although in two weeks the vomiting had entirely ceased, the washings were continued at intervals of two or three days for a month until the water siphoned out was free from mucus.

In severe cases of chronic indigestion the washings at intervals of two or three days may be continued with advantage for several months. It must be remembered that in these chronic cases of indigestion the patient is ill through abuse of the stomach—usually because too strong food has been given, or too much of a suitable food has been given at too frequent intervals. As important, then, as the stomach-washing, is the giving of food suited to the child's digestive capacity. Lavage is of little service if the bad feeding continues.

The field of usefulness of lavage is not entirely confined to vomiting cases. Children with indifferent appetite and limited food capacity, but without vomiting, are often greatly benefited by the treatment. A story frequently heard in our consulting room is as follows: Food is taken without relish. The child must be coaxed to eat. There is loss of appetite, usually the result of improper food or faulty feeding methods. Some patients are absolutely indifferent to food; many refuse it altogether. In this class a stomach-washing once a day will often be followed by a surprising improvement in the appetite. I know of no better appetizer for many of these pitiful looking babes. In not a few instances I have been surprised at the large amount of mucus removed from the stomach of one of these children in whom there had been no vomiting whatever, which teaches us that there may be, in infants, stomach disorders of considerable importance without vomiting or, in fact, without any other symptom than loss of appetite and malnutrition.

GAVAGE

Gavage, or forced feeding, is the introduction of nourishment into a child's stomach by means of a tube (Fig. 120). The tubes are to be

obtained at the instrument-makers and are known as "stomach-tubes for children," or the physician can make one himself at a small cost. All that is required is a soft-rubber catheter, American No. 12, a ⅛ inch glass tube 2 inches long, 2 feet of ¼ inch plain rubber tubing, and a small glass funnel. An extra opening should be cut in the catheter about ½ inch from the original one. This allows a more rapid introduction of the nourishment. The opening can very easily be made with a small pair of curved scissors.

The position of the child for gavage may be the same as for stomach-washing, or the child may rest on his back (Fig. 121). It is well to clear out the stomach with warm water before each feeding. In children without teeth the bare index-finger is all that is necessary to keep the mouth open. In children with teeth the Denhard gag of the O'Dwyer intubation set (p. 620) should be used.

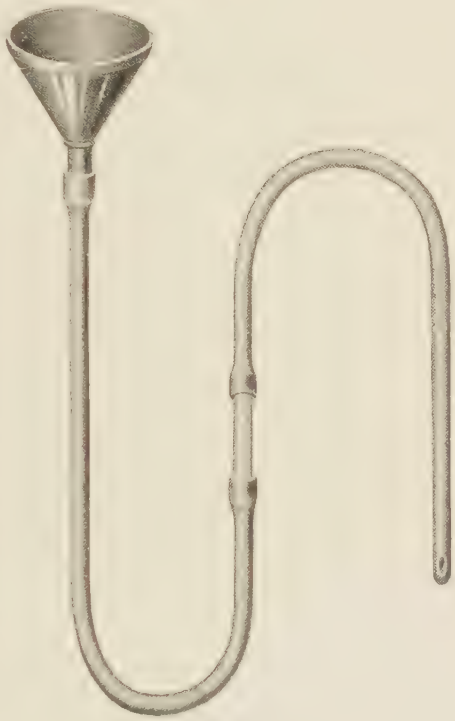


Fig. 120.—Stomach-tube.

Gavage, or forced feeding, will be found useful in three types of cases: first, as a means of feeding in obstinate vomiting.

In Obstinate Vomiting.—Several years ago, when the writer was resident physician at the New York Infant Asylum, a series of observations were made on cases of persistent vomiting which could not be controlled by stomach-washing or the ordinary means of treatment. It was found that patients who could not retain a teaspoonful of water administered by a spoon or a bottle would retain from ½ ounce to one ounce of water given through a tube. The same child who vomited one teaspoonful of milk or other food would retain this amount and a great deal more when the food was given by the tube. This discovery led to more extended observations. Twenty cases of persistent vomiting in all were treated in this way, of which eighteen were relieved. This series of observations was the first made relating to the use of gavage or forced feeding in persistent vomiting.*

When used for the obstinate vomiting cases, it is well to use gavage

*Kerley: "Gavage in Persistent Vomiting in Infants," Archives of Pediatrics, February, 1891.

only once every four or six hours, with from one-third to one-half the quantity of food given in health.

The tube which is to be passed into the stomach should never be oiled, but merely dipped into the solution that is to be used. It is then passed in rapidly with the funnel empty and the nourishment is immediately poured into the funnel. When the food has passed into the stomach, the tube should be compressed and quickly withdrawn, as some of the liquid will be retained in the tube if it is withdrawn slowly.

Fig. 121.—Feeding by gavage.

If this is done without compressing the tube, an escape of food into the larynx may take place during the withdrawal of the tube and cause choking, coughing, and perhaps vomiting. The food selected should be thin dextrinized gruels, or broths and gruels combined, which have answered well in some cases.

In Severe Illness.—In a severe illness, such as diphtheria, pneumonia, and the grave intestinal diseases, gavage may save the life of the patient. Not infrequently, in such cases, insufficient nourishment is taken to support life. Rectal feeding is usually of value only for a day

or two, as children soon become intolerant of it. In such circumstances, gavage may be employed advantageously for several days at a time. In fact, it is the only way by which the child can be properly nourished.

Predigested cereal foods, completely peptonized milk, and stimulants well diluted may be given. Usually these patients badly need water. If there is no tendency to vomiting, a large quantity of water may be given with the nourishment selected, so that they may receive as much liquid as they are accustomed to in health.

In Malnutrition, Exhaustion, and Narcosis.—Gavage is also most useful in cases of extreme malnutrition and exhaustion, or in alcohol or opium narcosis. Infants suffering from an extreme degree of malnutrition and exhaustion are often admitted into a hospital; and occasionally they are seen in private practice. The children are so reduced in strength that not enough energy remains for the taking of nourishment. In these cases gavage is distinctly a life-saving measure. The food should be predigested cereals, peptonized milk, or one of the various peptone preparations, given in quantities suitable to the age of the child. For a child four months of age, from 2 to 4 ounces of peptonized milk may be given every two hours. Before the next feeding it is well to introduce a few ounces of water and withdraw it to see if the food has been properly digested. By this means of feeding there will be noticed, if the vitality is not at too low an ebb at the commencement, a daily increase in strength and vigor, which proves that the powers of assimilation persist after the desire for food or the child's ability to swallow it has passed. This proves that we must never regard such a case as hopeless so long as the child is breathing. Time and again, after a few days' feeding in this way, the child will take the food from the bottle or spoon. Breast-milk, if it can be obtained, may be given by gavage as successfully as can predigested cow's milk. The malted foods on the market have been used temporarily with advantage, for, while deficient in nutritive value for the well, they afford sufficient nourishment for temporary use in the very ill, and are easy of digestion.

Illustrative Case.—In a recent case seen in consultation, the patient, three months old, was almost moribund, as the result of extreme malnutrition. The temperature ranged from 94° F. to 96° F. for several days. No food could be taken. A wet-nurse was secured, but the child would not nurse. He was pale, apathetic, and too weak to cry. The wet-nurse's milk was drawn from the breast and spoon-feeding attempted, but swallowing was impossible. One and one-half ounces of breast-milk were fed by gavage, but this proved too strong, and the child promptly vomited. The milk was then diluted one-half with weak barley-water. At first one ounce was given at a feeding; then this was gradually increased to two ounces, all the feedings being retained and digested. In a week the child was able to nurse, and made a complete recovery, weighing, when seven months of age, 14 pounds. At the time gavage was commenced the weight was but 5 pounds.

COLON IRRIGATION

Colon irrigation was brought prominently into use several years ago as a remedy in the intestinal summer disorders of young children. While unquestionably its usefulness in this respect has been overes-

timated and the irrigation overdone, in selected cases it is of great service. Because a child has summer diarrhea, colitis, or any disorder of the intestine, it does not follow that irrigation is indicated or that he will be benefited thereby. A child who is having a passage from the bowels every half-hour or hour is not, according to my observation, a fit subject for irrigation. The colon is kept empty by the active peristalsis, and the washing will remove nothing more than a few shreds of mucus. The cases benefited by irrigation are those in which peristalsis is not particularly active. When a child is running a temperature of 102° F. and over, with five or six green mucous passages daily, one or two colon irrigations a day will unquestionably be of service in removing the offending material from the intestine.

Fig. 122.—Colon irrigation.

Every year we see a few cases of intestinal infection, particularly those of a very acute type, in which there are high fever, intense prostration, and infrequent bowel action. Occasionally we see a case of this sort in which there is no movement whatever without assistance. In such cases colon irrigation is of inestimable value, and may be used with advantage as often as once in six or eight hours. The washing, even if properly conducted, is apt to be strongly objected to by the patient and should be completed as soon as possible. Too frequent irrigations, with strong medicated solutions, may keep up the mucous discharge indefinitely. In a few children the resistance with straining is so marked and so continuous that irrigation is impossible. These are usually children who, on account of the excessive peristalsis, do not require irrigation.

The irrigation is conducted as follows: Normal salt solution at 95° F. is ordinarily used, and a quart usually suffices. If there is a great deal of mucus and blood, a 1 per cent. tannic acid solution is better. The irrigation should be continued until the solution returns clear. The

temperature of the solution may be varied with advantage, depending upon the nature of the case; thus, in cases with subnormal temperature and intense prostration, cases of the so-called "algid" type, the solution at 110° F. will act as a decided stimulant. It raises the temperature, improves the pulse and the general condition of the patient. In cases with high fever—105° F. or 106° F.—a cold solution answers better. I have repeatedly employed a temperature as low as 70° F., and have often found that an irrigation with four pints of water at 70° F. would reduce the body temperature three degrees.

For irrigation, a soft-rubber catheter, No. 18 American, is best, for the reason that its walls are stiff and the tube does not easily bend upon itself, as is apt to be the case when an ordinary catheter is used. Should this occur, the water may escape an inch or two within the rectum, and obviously be of no service. When the tube, well lubricated, has been introduced for 9 inches, the tip will have passed into the descending colon, and further introduction will be of no advantage. When the end of the tube is in the colon, gentle palpation over the left side of the abdomen will enable one readily to locate it. The tube is attached to an ordinary fountain-syringe by passing the distal end over the smallest rectal tip, which is a part of the outfit of every fountain-syringe. The bag should be held not over three feet above the child's body. When the water is allowed to run, the buttocks should be pressed together, for by so doing we hope to flush the entire large intestine. If this can be done, the irrigation will be most efficient.

In this connection I mention a beneficial effect of irrigation, of which we hear but little, viz., the absorption of a portion of the salt solution by the intestines (p. 764). Not a few of the intestinal cases have a very limited food capacity. As a result of the vomiting and very frequent liquid stools, the body is thoroughly drained of fluids. In such cases, after the washing is completed, I endeavor to have the child retain as much as possible of the normal salt solution. As an aid to this, the child should be placed on his left side with the buttocks elevated and the tube introduced well up into the descending colon. The buttocks should be pressed together so as to assist in retaining the water after it has passed into the bowel. When a half pint or a pint has passed in, the tube should quickly be withdrawn and the child kept for half an hour in a recumbent position with the buttocks elevated. The salt solution will be best retained when it is used warm, at a temperature of from 100° to 105° F.

COLON FLUSHING

Colon flushing consists in passing into the descending colon a considerable quantity of normal salt solution or bicarbonate of soda solution, ½ ounce to 1 pint.

The measure is used with much benefit in selected cases in which but little fluid is taken by the natural channel. I have often been surprised at the possibilities of the large intestine for absorbing fluids when they are urgently needed by the organism.

Illustrative Cases.—A boy with cyclic vomiting who had retained absolutely nothing given by mouth for three days retained one pint at the first colon flushing, one-half pint more after six hours, and another half-pint six hours later. The flushings were begun on the third day of the attack. Although the prostration was extreme, the prompt improvement in the general condition of this patient was most gratifying. After the first injection the pulse improved, the apathy disappeared, the child began to ask questions and showed interest in his surroundings.

A boy nine years of age, ill with scarlet fever, who could take very little fluid, was able to retain eight ounces of a salt solution given at eight-hour intervals for three days.

A child six months of age had retained absolutely nothing in the stomach for six days, because of an intussusception. When I saw him on the sixth day the respiration was superficial and slow. He was cold and practically pulseless. The second heart-sound could be heard but faintly with the stethoscope. The intussusception, greatly to my surprise, was reduced by water pressure (p. 233). Hot salt-water flushings were at once begun; the patient retained twelve ounces, given at a temperature of 110° F., and in a few minutes there was a very perceptible improvement. With repeated flushings at six-hour intervals the child continued to improve and made a perfect recovery.

Severe toxic cases of diphtheria and scarlet fever, in which but little fluid is taken and in which the toxicity of the blood is extreme, as shown by the stupor and delirium, are often much improved by the free use of colon flushing, which supplies the water which the child needs, but which cannot be given by mouth, or if given may not be retained.

Method.—I usually order the salt solution given in quantities of from one-half pint to a pint, depending upon the age of the child, at intervals of from six to eight hours, but never at a lower temperature than 100° F.

The apparatus required is a small rectal tube attached to a fountain-syringe.

The flushing is best given with the patient resting on the left side, with the buttocks elevated on a pillow, the tube, well oiled, being introduced at least 9 inches into the bowel. The solution at 105° to 110° F. is allowed to pass into the bowel, and the tube is then quickly withdrawn. To facilitate the retention of the fluid the patient should remain on his side for one-half hour.

VACCINE THERAPY

Fundamental Principles.—Vaccine therapy for prevention or cure of infection has for its object the production of an active immunity to the specific bacteria concerned, while serum therapy produces a passive immunity only.

Immunity, which is resistance or lack of susceptibility to a given disease or microörganism, may be natural or acquired. Artificial or acquired immunity may be the result of an attack of the disease itself or may follow inoculation with living cultures of microörganisms in sublethal doses or in an attenuated state with dead cultures, or with those products of the growth and metabolism of bacteria known as toxins. Immunity so acquired is active or direct, comparatively slow in appearance, and of comparatively long, though variable, duration. It is brought about by the development in the blood-serum of substances antagonistic to the vital activity of the bacteria or to the toxins. Such

substances are known as antibodies. The serum of an animal which has been actively immunized and which is rich in antibodies may be inoculated into another animal for the purpose of combating infection. The immunity thus produced in the second animal is indirect or passive and of comparatively short duration.

The antibodies are of several kinds: agglutinins, opsonins, bactericidins and lysins. They are formed by the tissue-cells under the stimulus of the infecting bacteria, at first locally, then generally, and are present in the serum and to a lesser extent in the other body fluids. They manifest themselves in certain definite ways, demonstrable and measurable by laboratory methods: agglutination reaction, opsonic index, bactericidal tests, and the complement deviation test. Clinically, their increase is accompanied by amelioration of the symptoms of infection. *The aim of both vaccine and serum therapy, then, is to aid the production of antibodies in order to effect a destruction of the invading bacteria and the neutralization of their toxins.* Metchnikoff claimed that the destruction of microörganisms is brought about by their ingestion by phagocytes, especially polymorphonuclear leukocytes. Denys and Leclef proved that there is a substance in the blood-serum which prepares the bacteria for phagocytosis. This sensitizing substance was named "opsonin" by Wright and Douglas, who elaborated methods for its study in the laboratory and for its practical application to the treatment of infections by means of vaccines made of suspensions of dead bacteria.

It has been found in general that the opsonins are below normal at the onset of an infection and during the height of the acute stage, and that, as improvement occurs, the amount of opsonin in the blood-serum increases. The administration of dead cultures of the bacteria causing the infection stimulates the production of opsonins.

Determination of Opsonic Index.—In order to estimate the opsonic index it is necessary to prepare serum from the patient, serum from a normal person, leukocytes from a normal person, and a culture of the bacteria from the patient's lesion.

Serum is readily obtained by pricking the finger and catching the blood in a small curved glass tube, as recommended by Wright. The blood is allowed to clot in the tube, and the resulting clear serum is removed by means of a capillary pipet, which is then sealed at its narrow end.

Leukocytes are obtained from a small quantity (about 10 drops) of normal blood caught in a tube containing 10 c.c. of 1.5 per cent. sodium citrate in normal salt solution. The mixture is centrifuged and the fluid carefully drawn off and replaced by normal salt solution, in order to wash the blood-cells free from serum. After centrifuging again the supernatant fluid is removed and the upper layer of white blood-cells taken up into a capillary pipet, whose lower end is then sealed in the flame. This is known as the "leukocytic cream."

The *suspension of bacteria* is made in normal salt solution from an agar-culture not over twenty-four hours old. It should not be too

thick, and should be free from clumps, which may be recovered by shaking or by manipulating with a capillary pipet.

Capillary pipets of the same caliber having been selected, equal quantities of the patient's serum, leukocytes, and bacteria are drawn up and thoroughly mixed in one, while normal serum, leukocytes, and bacteria are drawn into another. A control, using normal salt solution instead of serum, should also be made. The pipets are sealed below and incubated for fifteen minutes at 37° C. The mixture is then expelled on a glass slide, thoroughly mixed again, and spread on clean slides. After fixing in methyl-alcohol and staining in methylene-blue (Manson stain is excellent for the purpose), the slides are placed under the microscope and the number of bacteria contained within 50 leukocytes is counted. This gives the *phagocytic index*. The quotient of the patient's and the normal phagocytic indices equals the *opsonic index* of the patient. More satisfactory results have recently been obtained by making the tests with diluted serum, according to Neufeld. The opsonins in the normal blood-serum used for control are found to disappear in a lower dilution than do the immune opsonins in the blood of the patient who has been immunized by the disease or by the administration of vaccines. Detections from 1 : 10,000 may be made.

Preparation of Vaccine.—The vaccine is made by suspending agar-cultures less than twenty-four hours old in normal salt solution. Equal quantities of bacterial suspension and of blood from a normal person are drawn into a capillary pipet, mixed, and thinly spread on a slide. The red cells and the bacteria are then counted in a number of fields. Since the normal blood contains 5,000,000 red cells to the cubic millimeter, the number of bacteria in proportion to the red cells can be estimated per cubic millimeter, and the actual count per cubic centimeter readily calculated. The tube containing the bacterial suspension is sealed and heated for two hours at 60° C. Control cultures are then made to test the sterility of the undiluted suspension. This having been properly accomplished, the vaccine is diluted in bottles of sterile normal salt solution, sealed with a rubber cap and paraffin, according to the dose desired per cubic centimeter. Thus, if the actual count showed that 5,000,000,000 bacteria were present in a cubic centimeter, diluting the vaccine 50 times by adding one cubic centimeter of undiluted vaccine to 49 c.c. of sterile salt solution would make a vaccine containing 100,000,000 bacteria in one cubic centimeter. Injections of one cubic centimeter or less are made into the shoulder, back, or thigh under strictest aseptic precautions.

Staphylococcus.—It is in staphylococcus infections that the vaccine treatment has given the best results. While it is always wise to use a vaccine prepared from the patient's own strain of staphylococcus, it is not absolutely essential that this be done. Any stock vaccine which has given good results in a similar case may be used, provided that it has been proved by a culture made from the pus of the patient's lesion that staphylococci are the infecting agents. It is essential also to know whether the Staphylococcus aureus or albus be present, in order that

the appropriate vaccine may be employed. The dose in infants under two years should vary from 50,000,000 to 100,000,000 of dead cocci. The inoculations are repeated on the sixth to the tenth day if necessary. When the opsonic index is estimated throughout the vaccine treatment of such a case, it is observed that a slight fall in the index follows the injection and that it may be accompanied clinically by a slight feeling of malaise, although no rise of temperature should occur. This constitutes Wright's negative phase of the reaction of immunity, and is followed in one to several hours by a rise in the index and improvement in the clinical symptoms. As soon as the opsonic index begins to fall below the normal on the fifth to the tenth day, another injection is indicated. *As a matter of fact, the test for the opsonic index has been found to be too uncertain to make it practical and worth while to follow systematically, the clinical symptoms being sufficient indication of the value of the vaccines.* Too rapid or too large dosage must be avoided, because there is danger of exhausting the responding power of the human organism by overstimulation. The temperature should be taken before the vaccine is injected, and every three hours during the following twenty-four.

Furunculosis in young infants has proved readily amenable to treatment by staphylococcus vaccines. Improvement is shown by a much more rapid healing than usual of the furuncles already incised, and by the non-appearance of new ones. After the second inoculation improvement is the rule. The amount of pus is lessened and fewer dressings are required than in cases otherwise treated. No bad effects from the injections have been noted.

In *acne* excellent results have been obtained by some observers; others report negative results. Larger doses are usually necessary. In these cases the best results are obtained from mixed vaccines of the acne bacillus and the Staphylococcus aureus.

In treating *otitis media* of staphylococcus origin, vaccines are reported, evidently by enthusiasts, as having proved of value, also in treating *suppuration in the antrum, styes, osteomyelitis,* and *empyema.* In rare and favorable cases of the latter disease it is claimed that operation may be obviated by the vaccine injections. After operation the vaccine may prove of real service in aiding the more rapid disappearance of pus from the pleural cavity and in hastening the healing of the wound.

Any *local suppuration* due to staphylococci is rapidly benefited by vaccine administration. In *general septicemia* the results have been encouraging (Wright). Fifty million dead bacilli are to be given at the first injection; this is followed in five days by 100,000,000 and again in five days by 100,000,000. The subsequent administration is dependent upon the requirements of the case.

Streptococcus.—In all cases of streptococcus inflammations the results of vaccine therapy have been far less brilliant than in staphylococcus cases, but still encouraging enough to warrant their further

use. It seems to be essential, also, far more than in the staphylococcus injections, that the vaccine be prepared from the strain of streptococcus isolated from the patient. The dose is about 2,000,000 to 3,500,000 in babies under one year of age, 5,000,000 to 7,000,000 between one and two years, 10,000,000 to 30,000,000 in older children.

Erysipelas.—In erysipelas Shorer found that the course of the disease is apparently shortened by the inoculation of dead streptococci, but that neither migration nor recurrence seems to be prevented.

Scarlet Fever.—In scarlet fever the opsonic index to streptococci has been studied by Tunnicliff, who found that it is below the normal at the onset of the disease, but rises when the acute symptoms subside. As local streptococcus complications appear the index falls once more. Favorable results following the injections of dead streptococci in cases of scarlet fever have not thus far been reported. On the other hand, this treatment of local streptococcus inflammations—*adenitis, otitis media,* and *osteomyelitis*—has given most encouraging results.

Typhoid Bacillus.—Inoculations of dead typhoid bacilli as a prophylactic measure against typhoid fever have been extensively employed in the English, German, United States, and Japanese armies. The most recent statistics (Russell) show that the incidence of disease is 6 to 15 times as high among the non-inoculated as among the inoculated soldiers. Not only are the numbers of cases far less numerous among those who have been vaccinated, but the clinical course is much less severe and much shorter, while complications are fewer. In view of these results prophylactic inoculation of children as well as of adults is to be recommended during epidemics of typhoid fever or before entering a typhoid district. Immunization is accomplished in three vaccinations, the dose of which, in children, may be 100,000,000 to 500,000,000 dead bacilli.

By lowering the incidence of typhoid fever cases antityphoid vaccination prevents the development of carriers of typhoid bacilli, and thus is fully justified. The development of carriers by the inoculation has been reported, but it is rare.

Gonococcus.—In vulvovaginitis due to the gonococcus in infants under one year of age, the injections of dead gonococci have had no effect in shortening the course of the disease, in lessening the amount of discharge, nor in causing the cocci to disappear from the vagina. In older children Hamilton and Cooke found that the effect of the dead gonococcus injections is more marked in chronic than in acute cases, the disease being very decidedly shortened in its course. The later stages of the acute cases were also shortened, while no result was noted in the first weeks of the attack. Hamilton and Cooke observed no advantage from the use of a vaccine made from the patient's own organism. The initial dose of 5,000,000 was gradually increased to 40,000,000 or 50,000,000, according to the needs of the case. Injections at eight- or nine-day intervals proved best. (For personal observations see p. 454.)

Pneumococcus.—The few cases of pneumonia in which dead pneumococci have been injected showed no marked advantages over untreated cases. In *empyema* of pneumococcus origin healing has been hastened by inoculations of dead pneumococci (Ross).

Meningococcus.—In cerebrospinal meningitis due to the meningococcus of Weichselbaum vaccine therapy has been tried, but it has become superfluous in view of the brilliant results obtained by means of the anti-meningococcus serum of Flexner and Jobling. Prophylactic inoculation is still in the experimental stage, but will probably prove of value in infected districts.

Bacillus Coli Communis.—Inoculations of dead colon bacilli in doses of 10,000,000 to 50,000,000 are reported to have given excellent results in cases of cystitis and pyelitis due to that microörganism. The symptoms are said to subside rapidly, and the bacilli to disappear from the urine in a comparatively short time.

Pseudodiphtheria Bacillus.—In *otitis media* due to this organism Dr. Tunnicliff obtained apparent benefit in some cases by injecting the dead bacilli. The attack of otitis was postscarlatinal and acute.

Tubercle Bacillus.—Local tuberculous lesions have been treated by injections of tuberculin in very small doses with good effect. This is true of chronic local tuberculosis without constitutional symptoms, especially in bone, joint, gland, skin, and eye affections. In pulmonary phthisis of a chronic type, running a nearly apyretic course, tuberculin is also of value. In all acute tuberculous lesions with marked fever and general symptoms tuberculin therapy has proved useless, and it may be attended by grave danger. The dose of crude tuberculin,* administered for purposes of immunization in a chronic tuberculous lesion, should be very small, $\frac{1}{5000}$ milligram, gradually increased to $\frac{1}{2000}$, $\frac{1}{1000}$, or more. The inoculations should be repeated not oftener than once in ten days, at first, and the temperature carefully measured every two hours. If a rise occurs, the dose has been too large, and must be reduced at the next injection. In selected cases of bone and joint disease and also in adenitis, good results have followed six or eight months of continued treatment, the dose being gradually increased in amount and the intervals shortened to three days. Wright maintains that the opsonic index is an essential guide to the regulation of the dosage. Other observers are satisfied that the clinical reaction is a sufficiently accurate guide. The opsonic index to the tubercle bacillus is low in cases of tuberculosis, unless it fluctuates, due to autoinoculation from an active lesion. It is the office of the treatment to permanently raise the index.

PROMISCUOUS USE OF DRUGS BY THE FAMILY

While the giving of drugs to children by members of the family is not to be encouraged, I find it wise to furnish to most mothers a list of "permissibles." The love of people all the world over for drugs and the faith in their efficacy are so great that if medicines are not supplied by the physician, they are very apt to be secured elsewhere. If the reader

* Koch's old tuberculin, prepared by the New York City Board of Health.

has had an opportunity to look through the closets or chests of his patients where medicines are kept, he perhaps has been surprised at the number of preparations of proprietary and patent medicines which met his gaze. The solution of the so-called "nostrum evil" would be very simple if every physician would take the trouble to explain to his patients the character of—or, better, send them a copy of the official analyses of—the various proprietary drug preparations on the market. They should be convinced not only of their worthlessness, but also of the dangers attending their use. If mothers knew that most cough syrups and colic cures contain opium or some of its derivatives, they would not give them to their children. Neither would they themselves take the various tonics and restoratives, "discoveries," and "bitters" in the market if they knew that they contained a large percentage of alcohol. It is the duty of physicians to counteract, by teaching, the influence of the ingeniously constructed medical advertisements in the daily and weekly press, in both religious and lay periodicals. Not a little of what passes for knowledge of diseases and their so-called treatment is thus obtained by the layman through means that are intentionally misleading.

It has long been my custom to give the mother prescriptions for coughs, for head colds, and for constipation. They are prepared and kept on hand for use in case they are required. At the same time the mother understands that I am to be called at once as soon as the child has fever. In defense of this practice, which may be open to criticism, I would state that I prefer to have my young patients take the remedies I prescribe, and which are harmless, rather than to have them run the risk of the administration of opium and alcohol, which would be very apt to be given if this precaution were not taken.

XXI. GYMNASTIC THERAPEUTICS

The section on Gymnastic Therapeutics is included in order to call the attention of general practitioners to the value of such work and to assist them in applying necessary treatment. Exercises are most often used therapeutically for children in the treatment of the following conditions: Flattened or narrowed thorax, kyphosis, scoliosis, flat-foot, congenital ataxias, and acute anterior poliomyelitis; also in cases of habitual constipation, malnutrition, etc.

The following pages contain a description of the methods which have been carried out most successfully with my patients by Dr. Hugh Currie Thompson, of New York, to whose patience and skill I am indebted for the recovery of many cases, some of which had resisted other methods of treatment.

The family physician has an opportunity of seeing these conditions at a much earlier stage than has the specialist, and at a time when they may be more easily corrected than in later life. When discovered, such conditions should never be neglected with the idea that in time the child will outgrow them. Such a belief is often fallacious, for unless properly treated, they are apt to become permanent. The necessity for the correction of physical defects in children is readily appreciated by parents. Certain principles or rules are involved in every form of practice. The following principles are generally applicable in gymnastic therapeutics.

RULES

I. Examination.—As far as possible, obtain a complete history of the case. Make both a general and a detailed physical examination; under the latter, note the musculature, condition of the skin, posture, any deviation of the spine, position of thorax and scapulæ, side lines of body, compare length of limbs, note the condition of the feet. It is often advantageous to take the height and weight and certain measurements, such as girth of neck, chest, and waist, and depth of chest and abdomen. In cases where the nervous system is especially involved, apply the tests usually made in such cases.

II. Conditions Under Which Exercise Should be Taken.—*Temperature of Exercise-room.*—The temperature of the room should be from 70° to 75° F., depending upon whether or not the patient is dressed. There should be no draft upon the patient. Therapeutic gymnastics involves fewer groups of muscles than ordinary gymnastic work and the execution is slower. The general circulation and respiration are not stimulated as much, and, therefore, the heat-production is less.

Clothing.—In the beginning, the parts of the body involved in the exercises should be devoid of clothing. A single thickness of clothing

may mislead as to the corrective effect obtained. At frequent intervals, at least once a week, the child should be uncovered for the purpose of observation during exercises. It is sometimes desirable to have the clothing removed during each treatment. At all times a child's clothing should be simple and hygienic, permitting unhampered movements.

Double Mirrors, Etc.—The use of double mirrors and a stringed screen are sometimes desirable so that the child may see when he has a correct position.

III. Frequency and Duration of Treatments.—Treatment should be given either for a half-hour or an hour, three times a week, or a half-hour or an hour daily (Sundays and holidays excepted), the arrangement being dependent upon the needs of the case and the physical condition of the patient. The above is not too often if the following points are considered:

(*a*) The length of time during which the condition has been developing.

(*b*) The number of waking hours intervening between treatments when faulty postures are apt to be maintained.

(*c*) That progress should be made as rapidly as possible, so that the changed structure may be the basis for the period of growth.

Many times this rule must be modified, owing to the physician's lack of time and the expense to the patient's family. Instead of an hour's supervision daily, it may mean supervision by the physician only once every two weeks, supplemented by careful home supervision fifteen minutes daily. This should be the minimum of attention given to any case.

IV. Prescription of Exercises.—*Forms of Exercise.*—No certain system of exercises need be followed as long as the exercises used have an anatomic and physiologic basis. Both active and passive movements are used with and without resistance. Exercises with resistance given by the physician are used much in corrective work, for in this form of exercise the physician can easily judge as to the amount of exertion, and increase or decrease it at will, and the physician should remember that in most cases the stretching of the contracted muscles is quite as important as the strengthening of the weak and overstretched muscles. In cases of paralysis, injury, kyphosis, and scoliosis, where the weak muscles need treatment to restore their normal strength, the antagonistic muscles which are contracted and shortened should be stretched at every treatment (even though tenotomy has been performed) until the weak groups have regained their normal tone.

Accuracy of Execution.—Accuracy of execution of each and every exercise given in the prescription is essential. A possible exception to this might occur in the treatment of such cases as malnutrition or constipation, where exercise *per se* is the essential thing, but even in these cases conditions may be such that very careful work is necessary. A prescription of exercise in itself means little. The manner in which it is executed may actually aggravate the condition, as the wrong muscles may be made stronger by a faulty manner of execution. In writing out a prescription of exercise the physician should be guided by the

patient's capability for fairly accurate execution of each exercise. This cannot be gaged by the physical examination alone, but the examination must be supplemented by having the patient try the exercise for one or more days. Unless he can approximate the proper execution without assuming faulty positions or postures and without causing too much nerve and muscle fatigue, simpler exercises should be used. As the patient improves or becomes stronger, more difficult exercises should be given. In advancing, the rule regarding accuracy should be observed.

Exercises have several details which need to be watched in order to secure accurate execution. At first do not confuse the child by requiring absolute accuracy as to every detail; rather select one or two of the more important ones and insist upon the most rigid observance of these. As the child grasps and retains these ideas and is able to carry them out, require more, until all are mastered.

Concentration.—Frequent repetition of the exercises is necessary to obtain desired results. In repeating an exercise many times, a child easily forms the habit of executing it with but little effort, which will soon result in inattention and carelessness. When this occurs, bring about an increase of exertion on his part by insisting that every detail be mastered, or change to more difficult exercises.

Overwork.—If a child is fatigued at the end of an hour's rest following the treatment, he has been overworked, and the exercises should be made less difficult. A certain amount of muscle soreness must be expected during the first few days of work.

The patient may be weak and anemic. This should be borne in mind when the amount of exercise is increased. There should be less school work or play to insure sufficient rest and recuperation after the treatment. If that is not possible, the amount of exercise should be increased very gradually. Otherwise, overfatigue may result from the carrying-out of exercise excellent in other respects.

Rest.—In many cases the child should rest in a recumbent posture for half an hour after the treatment, and in nervous cases the treatment should be preceded by a half-hour's rest.

General Health.—Attention should be given to everything that will build up the general health of the patient, such as bathing, sleep, fresh air, general exercise, diet, and dress. Suitable furniture (chairs, tables, or desks, etc.) should also be considered. Attention to these things will sometimes shorten the time of treatment by eliminating causative factors.

Temporary Discontinuance or Modification of Exercises.—When the child feels indisposed, or there is an acute illness of an apparently simple character, the temperature should be taken. If fever is present, exercise should be omitted until the nature and seriousness of the illness are known. If there is no fever, the amount of exercise should be modified by providing one-half or one-third of the amount which otherwise would have been given, or the same amount of time with movements which require less exertion.

When a child having a lithemic diathesis, with predisposition to ca-

tarrhal conditions of the throat and bronchial tubes, is suffering from an acute cold, the exercises should be temporarily discontinued, or the amount of exercise reduced to one-third. If this precaution is not observed, a cardiac strain may result, such as sometimes follows play or exercise in one who has had acute rheumatism.

V. Adaptation of Exercise to Practical Ends.—Adapt corrective positions to all practical ends: walking, sitting, working, or playing.

VI. Coöperation.—Endeavor to secure the coöperation of members of the household, teachers, or servants between exercise periods in order that the progress of the child may be as rapid as possible. A child is not at first capable of adapting the work to practical ends without careful oversight by elders.

There are two objects in treatment: One which should always be obtained, that of improvement; and the other, complete and permanent correction, which should be the aim until an insurmountable obstacle is reached. To gain these are required continuous and conscientious work, and the coöperation of those in charge of the child and of the child himself. As a rule, these objects cannot be obtained in a short period of time.

After the treatment has been completed the child should be brought for examination every three months.

POSTURE AND BREATHING

Posture and breathing will first be considered, as they hold an important place in the correction of the conditions about to be considered. A good posture should be maintained during all exercises. Between treatments the child should maintain as good posture as his condition will permit. Telling him to do this is not sufficient: he should be given exercises which will strengthen the weakened and overstretched muscles and stretch the contracted ones, and thus enable him to assume an improved posture. The work for correcting posture should be taken up gradually. Have a child hold a good posture for short periods of time, beginning with one minute and working up to fifteen minutes. The child should be taught to assume and maintain a good posture during the entire day, no matter what he is doing, whether at work or play. In the standing posture the weight of the body should be brought forward until it rests over the balls of the feet or over a point midway between the toes and the heels. In sitting, the weight of the body should be carried over the posterior third of the thighs.

For general posture, my rule consists of the following steps: Heels together, or approximately so; knees well stretched; chest raised high; head erect with chin in (stretch up entire body as high as possible); poise weight forward over balls of feet; bring shoulders back and down. The feet should be turned outward slightly or kept straight. (See Fig. 123.)

In the above rule do not relax any previous step as a new one is taken. In sitting, insist that the hips be pushed well back in order that the child

may not slide forward so as to bring the weight of the body over the lower spine.

From the beginning, an attempt should be made to improve the posture. Take the essential details for the child to follow and increase the requirements as fast as practicable. These individual details have been tersely expressed in different ways, and one expression may convey the idea of the detail more clearly to one patient and another expression to another. For instance: "Chest Up!" may mean that you wish the child, if he has relaxed, to take the best possible posture of the thorax. In taking a good position of the thorax, there should be no raising of the shoulders, no conscious taking in or holding of the breath, and the trunk should not be inclined backward, nor the pelvis or abdomen permitted to project forward.

Fig. 123.—General posture.

General Considerations.—1. When children use bicycles, velocipedes, mail wagons, etc., where they propel themselves by pedaling, they should not ride with head and shoulders forward and chest contracted to gain advantage and leverage, but should have the body inclined forward from the hips, back straight, and chest expanded.

2. Improper and insufficient diet, poor assimilation, lack of fresh air, and disturbed sleep cause a loss of general tone, which tends to make a child relax and assume bad postures. All these matters should receive attention. (See Tardy Malnutrition, p. 92.)

3. *Clothing* should be examined to see that it causes no pressure or tension. All garments should be loose and simple. The underclothing should be elastic and light in weight. The stockings should fit the feet and should be supported by soft elastics extending from V-shaped pieces at the side of the waist, which catch the stockings on the outside of the legs. The shoes should have flexible soles, a fairly straight line on the inside, a low broad heel, and should be broad enough to permit the toes to spread. So much depends upon the condition of the feet, both in standing and walking, that they should receive as careful daily attention as the hands. Hats should first be for protection. They should be light in weight and should come far enough forward to protect the eyes from the sun, and should never be worn far enough back to make the child tilt his head to balance the weight, or to make him bend it forward to protect his eyes from the sun. Outside wraps should

be sufficiently light in weight and flexible enough to permit free movement in walking or running.

4. *Sleep.*—A child should not form the habit of sleeping always on one side with the knees drawn up to the chest, but change from side to side. If the posture is very poor, he should for some time sleep on the back with limbs extended, and without a pillow. The mattress should be thin and firm, and the child's covering light in weight, and only a small pillow used.

5. *Furniture.*—The furniture a child uses, especially his chairs, tables, or desks, should be adapted to his age and height. Furniture not properly adapted to children is one of the main causes of bad posture. Chairs should have the height of seat correspond to the length of the lower leg.

Fig. 124.—Adjustable table, Dr. Mosher's chairs, board, ladder, and blocks for ataxic exercises.

The child's feet should rest comfortably upon the floor, and there should be no pressure under the knee. The depth of the seat should be no more than the length of the thigh. If it is greater, the child tends to slide forward and assume a bad posture with the weight of the trunk over the lower spine. The back of a chair should not have upright spindles, but cross-pieces, or, at least, one cross-piece sufficiently high above the seat to allow the fleshy part of the hips to project underneath it in order to bring back the tuberosities of the ischia far enough to support the weight of the trunk in a good position. The lower cross-bar, preferably adjustable, should support the back at the junction of the dorsal and lumbar vertebræ. In addition there should be another cross-bar to support the upper back.

Dr. Mosher's kindergarten chair, sold by The Milton Bradley Com-

pany, 11 East 16th Street, New York city, is the best chair for children that has come to my attention. It is constructed in three sizes, with seats ten, twelve, or fourteen inches in height, but there is no lower cross-bar for the support of the back. If the seat of a chair is hollowed out, there should be no raised border at the back, as it would prevent the hips from being pushed well back. If well-constructed chairs cannot be obtained, ordinary chairs may be modified for use in the nursery or for older children, by selecting those having a cross-bar several inches from the seat and sawing the legs off. If the seat proves too deep, a pillow may be placed between the child's back and the back of the chair, but should not extend below the waist-line. It may be held in place by tapes.

6. *Heredity.*—Parents often attribute a bad posture with flat chests or other physical deformities to heredity, saying that a child "takes after" one parent or the other. Heredity is usually only a slight factor, *i. e.*, the child may inherit a frame or general constitution or certain mental and physical characteristics resembling those of a parent, but the faulty posture, flat chest, etc., are in most, if not all, cases acquired. A well-nourished infant has a straight back. In a well child, one seldom sees a flat chest before the age of three years.

7. In very young children the deformity is often induced by the position assumed in play. For instance, the sitting position on floor or bed, with legs extended and spine bent forward, which most young children assume in playing, keeps the chest in a bad position for long periods of time day after day. This is especially true if, for any reason, the back muscles are not as strong as usual and cannot easily maintain the weight of the trunk in an erect position. For children who are kept in bed when not seriously ill, a folded blanket or air-cushion may be used as a seat, and a bed-table or tray for playthings and meals. A support may be used for the back if needed.

Fig. 124 shows Dr. Mosher's chair and an adjustable table, which may be made for use in the nursery. The top of the table, 2½ by 4 feet (or 3 by 5), is made of well-seasoned boards, ½ inch in thickness. These boards are held together by quarter-inch pegs and holes, as are the leaves of an extension dining-table. Two sets of light-weight wooden horses (legs ¾ by 2 inches and cross-pieces 1 by 2½ inches) are used for supports: one set, for use when the child is seated, 14 to 18 inches in height; the other, for use when standing, 24 to 30 inches in height. If desired, the whole may be painted white or stained and varnished. For reading there should be a book-support for the child's books, so that he may keep his head erect.

8. *School Hygiene.*—Physicians as well as parents should interest themselves in school conditions, as often it is in school that the child contracts bad postures, because of the long hours of confinement, unsuitable desks and seats, and frequently by a lack of proper ventilation.

Exercises.—The following exercises may be used for correcting bad posture:

1. The child stands with toes from 2 to 4 inches from a flat, perpendicular surface, as a closed door. Let him assume a good standing

position; sway the body forward from the heels (heels kept on floor) until the chest touches the door; but neither the abdomen nor head should touch it. (See Fig. 125.)

2. Raise arms sideways to shoulder height; lift heels; stretch up with head and chest, in with chin, and out with arms.

3. The child lies on his back on a fairly hard, flat surface. Place

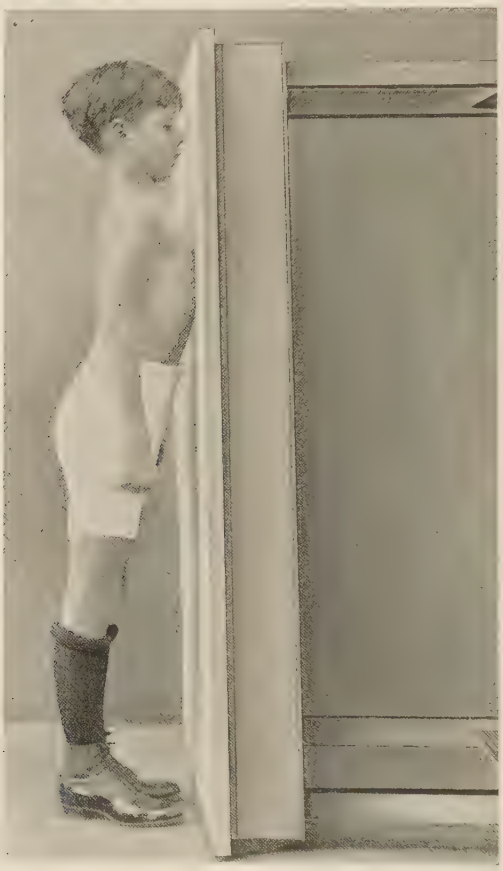


Fig. 125.—Posture exercise. Chest raising against a flat, perpendicular surface.

your hands under his head, raising it an inch or two. He then, reclining as before, arches his body from head to heels. (See Fig. 126.) The knees should be kept straight. In the beginning, as in figure, he may aid himself with his hands in arching body. Later the arms should be folded lightly on the chest.

4. The child standing, should raise arms sideways, turn palms up at shoulder height, and continue to raise them until the hands are midway between horizontal and vertical; sway body forward; stretch up with chest and head, in with chin, and out and up with finger-tips.

5. Clasp hands, back of head. Raise chest well and press head backward, chin in, resisting with hands. Keep elbows well back.

Walking Movements.—Have patient walk on balls of feet, with arms extended sideways, shoulder high, maintaining a good posture. When capable of doing this satisfactorily, repeat with arms raised over head; arms should be well stretched, fingers straight, palms facing and separated by the breadth of the shoulders.

Shot-bag Exercises.—A flat circular bag, 5 or 6 inches in diameter. The bag should hold from ½ to 2 pounds of shot, according to the strength of the child. With the child's back straight and chest expanded, head erect and chin close to neck, have him balance the shot-bag on

Fig. 126.—Posture exercise. Arching body.

top of his head: balance while sitting or standing from one minute up to thirty minutes; balance while rising from a sitting to a standing position from 5 to 50 times; balance while walking forward and backward across the room from 5 to 20 times; balance while walking on the toes across the room forward and backward from 5 to 20 times; balance the bag on the head while being read to; balance while taking the out-of-door walk for varying distances from 100 feet to ½ mile; balance while running in an easy manner.

Static Exercises.—*Exercises of Position.*—Simply telling a child to think, himself, to keep a good posture, presents the matter to him only in the abstract, and involves a mental strain. He must be given certain

things to do. The static exercise reduces the instruction to the concrete, and there is usually some responsive coöperation from the child. The use of the static exercises makes a good posture possible for the child, and they serve as an introduction to a habit of improved posture. The static exercises should be used in connection with the developing exercises, but only one set should be taken up at one time, to be continued from one to three weeks, and then another set taken up as conditions seem to require.

Illustrative Case.—The brother of a little patient was a persistent mouth-breather. Some months previous both tonsils and adenoids had been removed. The habit of mouth-breathing persisted, although its causes had been eliminated. I suggested that the mouth be kept closed, and that breathing through the nostrils be made an exercise, beginning with a minute on the first day and increasing a minute or two each day until the child could continue to breathe with closed lips for an hour. He was read to while doing this. He was urged to think of holding the lips closed at other times. He soon overcame the habit of mouth-breathing. This illustration shows that habit must be reckoned with—the removal of the cause does not alone suffice.

The following static exercises may be used with advantage to aid in the correction of bad posture:

Lying on Couch or Bed in Good Position.—Have patient take such position from one to ten times daily in order that he may learn to assume a good position whenever he takes a lying posture. The last time he should remain in a correct lying posture from five to twenty minutes.

Correct Sitting.—Have patient assume a correct sitting posture, beginning with a minute, once, twice, or three times in each school session, at each meal, during each study or reading period at home. Gradually increase the time until the child is holding a good sitting position from five to fifteen minutes during the above suggested period.

Correct Standing.—(*a*) Have patient rise from correct sitting to a correct standing position from four to ten times. (*b*) Have child when spoken to take good standing posture before replying. Often a child assumes his worst standing posture when spoken to, his mind being intent upon what is said to him, and he relapses into the original poor posture. (*c*) Have child hold good posture for from two to five minutes while conversation is carried on.

Similar ideas may be carried out while walking, running, skating, dancing, etc.

BREATHING

The primary object of breathing is to aërate the blood by carrying oxygen to it by the air that enters the lungs; secondarily, through the practice of deep breathing, the accessory muscles of respiration are developed, the breadth and depth of chest and the lung capacity are increased. In deep respiration the amount of air taken in is several times that inhaled in ordinary respiration. The amount inhaled in "tidal" respiration by an adult is 30 cubic inches, while that which can be taken in by forced inspiration is from 150 to 300 cubic inches. Daily practice of deep breathing in the open air helps to increase the resistance of the lungs to diseases to which they are liable.

A mistake is sometimes made in overdeveloping the chest muscles, so that the chest becomes to a certain extent "muscle-bound," and the expansion is lessened, instead of increased. There is little danger of this when the development comes from taking deep inspirations rather than by muscular activity alone. While a development of the chest muscles is desirable, they should not be developed at the expense of the normal expansion of the "respiratory chest." The aim should be to improve the mobility of the chest and the lung capacity as well as to strengthen the muscles.

Two kinds of breathing are usually spoken of: *thoracic* and *abdominal.* Breathing should be considered as a whole, unless one form is especially lacking, as, for instance, where a child has a very flat chest in which diaphragmatic or abdominal breathing greatly predominates over the thoracic, and there is little mobility in the upper part of the chest. If the abdominal breathing needs to be developed, have the child stand in a good posture, with hands placed lightly over the lower ribs, with tips of the fingers two or three inches from the median line, and take long, deep breaths until he secures a good movement of the lower ribs. The hands are placed over the ribs only for the purpose of feeling the movement.

All breathing exercises should be taken with the body in a good position and may be done while standing, lying, sitting, or slowly walking. Ordinarily they are taken in a standing position. If the muscles are weak or if it is difficult to stand in a good position, the exercises may be taken in a sitting or reclining position. When the breathing exercise is taken reclining, a couch or a board resting on two chairs may be used in preference to a bed or the floor. A small hard pillow or a folded bath-towel may be placed under the shoulders and upper back, but should not extend under the head. Such a pad is used with advantage in cases of kyphosis and lordosis.

It is better to take the deep breathing exercises in the open air, on the highest elevation in a nearby park, or during the daily outing, or even while walking to and from school or while driving. However, one must adapt himself to existing conditions, and at home the exercises may be taken on a piazza or balcony, or even indoors, with wide-open windows, but the air should be as free from dust as possible. If the windows are open in winter, the child should wear extra wraps or clothing.

A breathing exercise should be preceded by a number of strong, sharp exhalations through the mouth in order to empty the lungs as thoroughly as possible of residual air, so that the deep inspirations may fill the lungs with fresh, pure air.

The clothing should always be loose, with no constrictions at neck or waist.

Holding the breath at the end of full inspirations may be done to advantage, if it is not held longer than five seconds. Retaining the air after full inspiration causes it to become warmer. As it becomes warmer it expands and penetrates the better into the alveoli. Retaining the

air from one-half to one minute or longer is not wise. Becoming warmer, it continues to expand and may overdistend the alveolar walls. Prolonged holding of the breath has also a deleterious effect upon the heart.

If, when the child begins to take deep breathing exercises, he feels dizzy, he should not at first fill the lungs to their greatest capacity or hold the breath, and each deep inspiration should be followed by several ordinary ones. After a few days the dizziness usually ceases.

In all cases deep breathing and respiratory exercises should be given.

Fig. 127.—Breathing exercise. Inhale as arms are raised, sideways, upward, to vertical.

They are of special value in malnutrition, constipation, flat chest, and scoliosis.

Breathing Exercises.—Take a good standing posture.

1. Inhale deeply and exhale slowly.
2. Place hands lightly on lower chest. Inhale deeply; exhale.
3. Place hands lightly on upper chest, elbows well back and down. Inhale deeply; exhale.
4. Inhale as arms are raised sideways to shoulder height. Exhale as arms are lowered.
5. Inhale deeply as arms are raised forward and upward, to a vertical

position. (From the beginning have elbows, wrists, and fingers straight, palms facing each other and separated by the breadth of the shoulders.) Exhale as arms are lowered sideways.

6. Inhale as arms are raised sideways to vertical. (Elbows, wrists, and fingers straight—turn palms up when arms are shoulder high.) As vertical is reached, bend head slightly backward, stretch up and continue inhaling, while you slowly count three. Raise head; exhale as you lower arms sideways. (See Fig. 127.)

In the illustration the wrists are strongly flexed and the palms are not turned in, raising to vertical. The action is stronger. Either position of the hands may be used.

7. Arms at sides, elbows, wrists, and fingers extended. In one quick, continuous movement raise arms forward and flex forearms upon the chest, palms down, elbows drawn well back. At the same time a step forward is taken—the weight of the body is supported over the forward foot, the ball of the other foot resting on the floor. With the above movement inhale deeply. Exhale as the arms are lowered to side.

In Nos. 4, 5, 6, and 7, above, put the emphasis on the upward movement. In lowering the arms, keep chest high and arms well stretched, but make the movement an easy one.

If the heart is weak, in the above exercises the arms should not be raised above the level of the shoulders, and all the exercises should be done more slowly and with less exertion. If the breathing becomes labored, or the countenance shows signs of interference with circulation, the child should rest until pulse and respiration return to their usual rate.

Where deep respiration is an end in itself, in addition to the preceding breathing exercises, others which favor involuntary deep breathing should be given. It is important that a good posture be maintained throughout.

Exercises for Younger Children.—1. Walking up-hill at a moderate pace without stopping.

2. Running in place, *i. e.*, executing a running movement without advancing.

3. Distance running—from fifty yards to a mile. The minimum distance to begin with, and the maximum distance to work up to, in accordance with the general condition and age of the child.

4. Running games, such as rolling a hoop, playing tag, etc.

Exercises for Older Children.—In addition to those just mentioned:

1. Games, such as hand-ball, basket-ball, tennis, and foot-ball as played by boys.

2. Swimming for distance, when accompanied by a competent person in a boat.

FLAT CHEST

In flat chest the weight of the body is usually carried too far back, the abdomen and head being too far forward. The chest is flattened,

with ribs depressed, and there is interference with the proper expansion of the lungs. The shoulders often droop forward. The posture is one of general relaxation.

Flat chest is of common occurrence among children during the years of school-life. It should be carefully corrected on account of the deleterious effect on the lungs and abdominal organs. The necessity for its correction should be impressed upon the child. Attention to posture and breathing is essential. The aim should be to give exercises which will strengthen the muscles of the back and neck, deepen and broaden the chest, and increase its elasticity and breathing capacity. In addi-

Fig. 128.—Back exercise. Raise head and chest high.

tion to the exercises given under Posture and Breathing, I have found the following of benefit in these cases:

1. Have the patient lie prone on a hard, flat surface, hold the ankles while the patient raises head and chest as far as possible; the arms extended and raised with the body, the backs of the hands being turned toward each other with the thumbs up. In the first few treatments, the thumbs may be clasped. Hold position for from two to five seconds, or while counting from one to five or ten. (See Fig. 128.)

2. With knees straight, bend trunk forward until the hands touch the floor in front of the toes, or come as near to floor as possible, then raise the body to best possible standing position. Keep weight well

over balls of feet, raise the chest as high as possible, stretch the arms well down at the side; wrists, fingers, and elbows straight. Hold this position for from two to five seconds or while from five to ten are counted. The primary value of the exercise is in the elevation of the chest; secondarily, the back muscles are strengthened, and, in bending forward, the muscles that elevate chest are relaxed so that they are better able to give a strong contraction when the body is raised.

3. Have patient seated on a stool or low chair, and stand behind him. Patient swings straight arms forward upward to vertical, palms facing. He then turns palms forward and grasps your hands and pulls his elbows backward and downward close to sides. As he pulls them downward resist his movement.

Fig. 129.—Chest exercise. Stretch arms strongly.

KYPHOSIS

Kyphosis, as considered here, is an increase of the normal curve in the dorsal region of the spine, commonly called "round shoulders," produced by weakened muscles and bad habits of posture, or sometimes by improperly arranged clothing and by the occupation of the child. These causative factors should be removed as far as possible, and, as in all the deformities of childhood, attention should be given to posture, breathing, arrangement of clothing, etc.

The treatment given under Flat Chest is appropriate here, as the two conditions are often associated. The following exercises may be added:

1. Raise arms sideways to height of shoulders. Bend head backward with chin drawn in and at same time turn palms strongly upward.

When patient has learned to do this well, as the head goes back the arms may be raised to vertical.

2. Flex forearms upon chest, palms down and elbows well drawn back, shoulders level. Incline head slightly backward and fling arms forcibly sideways.

3. Raise arms sideways to shoulder level, turn palms up, make three short circles with arms, stopping with the backward movement. Raise arms a few inches, stretch out and up. Bring arms backward and downward to sides. (See Fig. 129.)

Fig. 130.—Weight of pelvis and lower limbs to stretch the lumbar spine.

4. *Hanging Exercises.*—A short curtain pole, 1¼ inches in diameter, may be placed in a doorway at desired height. Strong enough sockets can be obtained at a hardware store.

(*a*) Hang with overgrasp.

(*b*) Hang and swing.

Hanging is of much value in kyphosis and flat chest on account of its effect upon the spine and spinal muscles.

(*c*) Holding patient (see Fig. 130); trunk of patient resting against your body.

(*d*) Holding patient; upper back resting only against body.

Exercises "*c*" and "*d*" are used for the passive stretching of the lumbar and dorsal portions of the spine, the dependent part of patient's body acting as weight to stretch the spine. Hold from one-fourth to one-half minute. Repeat several times.

5. Patient sitting on stool or chair with arms forward, midway between horizontal and vertical, palms facing. Make resistance as arms are separated backward and downward. (See Fig. 131.)

6. Forearms flexed upon upper arms, hands closed and facing the front of shoulders. Strongly rotate forearms outward and backward. (See Fig. 132.)

7. Patient sits astride a stool and raises the arms sideways. With an assistant, either the child's mother or nurse, on one side, and yourself on the other, each grasp the patient's hand with one hand and place the other hand on his back in the region of greatest deformity. Have the patient pull the elbows close backward and downward to the sides, against resistance. At the same time gentle and firm pressure is made on the back.

8. Patient sits on stool, places hands low on hips, fingers forward and wrists straight, elbows drawn well back. Let him bend forward from hips with back straight. Place your hands over the regions of

Fig. 131.—Sit behind patient and give resistance on back of wrists as he separates his arms.

greatest deformity and have patient raise the body against resistance. The back must be kept straight, head erect, and chest well arched. When the patient can do this well, his hands may be placed on the back of the neck, instead of on the hips.

9. The patient stands, raises arms sideways, shoulder high; bends trunk forward from hips, back straight, and raises arms to vertical.

10. Patient lies face downward over end of couch or table, the whole body straight, hips and thighs only resting on table and held. Hands back of neck. Bend body forward until the chest touches the seat of a chair, then raise body as high as possible. (See Fig. 133.)

11. While the patient is in dorsal recumbency, with one hand hold

his knees firmly to prevent his body moving and have the other hand under his shoulders. Have an assistant (any adult) draw the patient's arms as strongly as possible in a line with his head and body, but away from them. When this is done, with the hand under the shoulders, gently but strongly raise his shoulders and body several inches from the table, hold while you count from five to ten, lower, and relax. Repeat from five to ten times.

12. With children who are not strong begin with exercises in a reclining posture:

(*a*) Reclining position. Arms extended at right angle to the body, palms facing each other. Separate arms against resistance.

Fig. 132.—Bring forearms back as far as possible.

(*b*) Reclining position. Arms extended beyond head in line with the body. Bring arms sideways, downward, against resistance.

(*c*) Deep breathing.

(*d*) No. 3 under Posture Exercises, but body arched only from hips upward, instead of from heels.

In the treatment of kyphosis or flat chest with lordosis this exercise may be given. While a child is taking deep breathing or chest raising alone, lying in a dorsal position, with or without the shoulders being raised by some supporting object, place your hand under the small of his back; after the chest has been fully raised, have him endeavor to press his back against your hand without lowering his chest. This may be done from 50 to 100 times. Later, the same exercise may be done in sitting or standing positions, the lumbar region being pressed backward while the chest is elevated and forward. The lumbar spine should be brought back only until the entire back is in one straight line.

The spinal muscles should be massaged to make them pliable.

SCOLIOSIS

Scoliosis, or lateral curvature of the spine, is a condition in which the spine deviates in whole or in part to one side or the other of the median line. It is accompanied by the rotation of the vertebræ, though

in some cases the amount of rotation is so slight that it is not easily detected; in other cases the rotation is marked in comparison with the amount of lateral curvature.

The treatment of curvatures resulting from such diseases as tuberculosis or caries of the spine, rickets, etc., will not be considered, but only the simple curvatures which occur in cases of general debility, muscular weakness, or are the result of faulty habits of posture, a short leg, certain occupations, etc.

Diagnosis.—In the treatment of scoliosis, much depends upon a careful diagnosis. As far as possible all the etiologic factors should be ascertained: the heredity, general constitution, and temperament of the patient; the general appearance, condition of skin, the musculature, its structure and tonicity, should be closely scrutinized. The patient's

Fig. 133.—Movement may start from position of complete flexion or partial flexion with body resting on seat of chair or on shorter stand or table.

habits of posture while standing and sitting, especially when he is unconscious of observation, should be studied carefully. Inquiry should be made as to position during sleep, and if a school-child, concerning the desk and chair, and position while writing, etc.

For examination the back should be bared down to the level of the trochanters, when the height of shoulders, height and prominence of hips, position of the scapulæ and their relation to the spine, the lines running from the tips of the ears to the tips of shoulders, and the position of arms as they hang at the sides, should all be noted. The position of the spine itself and its relation to points mentioned should also be closely observed when the patient is standing in his usual posture, and again when he is standing in his best possible position. The position of the spinous processes should be marked with a flesh pencil and

the curve carefully studied out; the contour and relative size of legs should be noted and the feet should be examined. To ascertain the amount of rotation, the patient should be made to take the Adams position.* If any difference is found in the height of the hips, a careful measurement of the legs should be made. Another important point to be determined is the flexibility of the spine, for to a great extent the diagnosis depends upon this.

On the front of the body, the position of ribs, end of sternum, umbilicus, and the tension of the abdominal muscles should be noted.

Besides the above examination, it is well to inquire into the history of the patient, as to diseases of childhood, present ailment, liability to certain diseases, as to amount of exercise, both outdoors and indoors, and as to the condition of the digestive organs. Examine heart and lungs. Certain measurements may be taken, such as height, weight, height sitting, girth of neck, chest, waist, hips, biceps, calves and insteps, depth of chest and abdomen, and breadth of shoulders, chest, and waist.

I have found the best method of recording to be by photographing the patient, using a thread screen, the spinous processes and lower border of scapulæ having been outlined with flesh pencil or dots of ink. To record the rotation, a lead tape may be molded across the posterior thorax at point of greatest convexity, while the patient is in the Adams position, and the tape carefully removed and its outline traced on paper.

The curve may be a single long curve, a double or a triple one. Endeavor to find out which is the primary and which the secondary or compensatory curve, for the normal position of the spine is the result of the adjustment of the weight of the body around the center of gravity, in order to balance the body while standing or sitting, and if there is a change in the normal adjustment of the weight in one part, there must soon be a corresponding change elsewhere, so that if there is a left convexity in the lumbar region, there will be a compensatory curve to the right in the dorsal.

In a well-marked case of scoliosis the child should be kept out of school for several months or a year. He should be allowed to retire early and sleep late, with a good rest at midday.

Treatment.—The treatment should be both general and local. In the general treatment, carry out a thorough hygienic régime, which includes exercise in the open air, baths, attention to diet and bowels, clothing, and general light exercise for muscle-building and stimulation of the circulation, respiration, and digestion. One of the most important things is to train the habits of posture.

The patient should be taught to lie on the side that will assist in straightening the curve, or upon his back in a good general posture.

Special Treatment.—Massage and exercises which act strongly upon the spine itself, and suspension—(*a*) bar; (*b*) in Sayre's suspension apparatus, with and without pressure—I have found most useful. It is

*Patient stands with heels together, knees well stretched, bends body forward from hips; head and arms hanging forward.

occasionally beneficial for a patient to wear a plaster cast or leather jacket during the day between treatments.

At first only general movements are given—those in which both sides of the body are used equally, such as the movements found under Posture and Breathing. A little later the exercises under Flat Chest and Kyphosis may be added, with simple movements of the body to strengthen the spinal muscles and make the spine more flexible.

The following may be used: body-bending forward, backward, to right and to left, and body-twisting to right and left. These movements may be done sitting or standing, and with the hands at the hips, back of neck, or extended over head.

The bendings and twistings to right and left may be taken with stronger effect when the trunk is inclined forward from the hips with chest and head held well erect.

In giving a new exercise the body should be bare, in order that the effects may be carefully noted.

In giving corrective bending and twisting movements the bending should be toward the side of the convexity, with added pressure at the point of greatest curvature, and the twisting movement toward the side of the concavity, with pressure over the point of the convexity. The following are some of the special exercises:

Fig. 134.—Spine being stretched by weight of body, pressure over convexities.

(A typical S-shaped curve, convexities, right dorsal and left lumbar, has been taken to illustrate the treatment. These exercises can be reversed. A single or triple curve will have to be studied out with back bared.)

1. Hanging from bar; pressure over convexities. (See Fig. 134.)

2. Hanging from bar. Place your hand over point of greatest convexity, and push patient's body sideways.

3. Hanging from bar. Have patient extend the leg corresponding to the side of lumbar convexity backward against resistance.

4. Lying prone on table; left hand on neck, right on hip: raise body (see Fig. 128, but with hands placed in accordance with text).

5. Lying prone on table; hands on neck. Carry patient's legs toward the convexity of the lumbar region.

6. Patient sits astride a stool; hands back of neck. Twist body to left; make pressure over right dorsal region.

7. Sitting on stool: left hand back of neck, right at hip; right leg extended backward. Bend body forward: resist patient as he raises body, using pressure over convexities. (See Fig. 135.)

Fig. 135.—Body raising with pressure over convexities.

8. Standing: flex forearms on upper arms, with fingers pointing over shoulders. Extend left arm upward and right arm downward and backward, and extend left leg backward.

9. Using wand, that is, about twelve or fourteen inches shorter than the height of the body; grasp at ends, with elbows straight; swing strongly from front of thighs to the right, sideways, backward, until the wand is at a perpendicular and in line with the spine. The body arches from heels to head. (See Fig. 136.)

"Key-note position."* Left arm extended upward; right arm sideways. (See Fig. 137.)

* Key-note position is the position of arms by which the spine assumes its best position.

10. (*a*) Take "key-note position" standing. Stretch body for from two to five seconds.

(*b*) Take "key-note position." Marching on balls of feet.

Do not give more than three or four special exercises in any one treatment, and follow each of them with a marching exercise, such as 10 *b*, or some breathing exercise.

EMPYEMA

The indication for therapeutic gymnastics is the promotion of the recovery of the impaired function caused by the compressed lung, the adhesions present, and the contracted chest-walls. In the neglected cases we also have the sequelæ in the deformed chest and spine, which should receive all possible treatment.

The initial measures are those which may be permitted while the patient is yet in bed, and consist of posture and the lightest forms of exercise. The posture immediately following operation is that of lying on the affected side, for reasons of better drainage and immobility. When the necessity for this posture has passed, children who are old enough should be made to lie on the sound side for several hours each day. A good-sized cloth bag, partially filled with bran or salt, properly covered, or a large roll of cotton, may be placed crosswise under the sound side of the chest during the exercise periods. This pad or bag further restricts the action of the chest on the sound side and increases the inspiratory action of the affected side. The exercises practised may be those of deeper or deep breathing, for from five to ten minutes, two or more times a day. Some authorities begin with deep breathing as early as the fourth or fifth day following the operation. The effect of deep breathing may be increased by the arm on the affected side being held over the head or extended beyond the head during the deep breathing; or the arm may be raised to either position upon each deep inspiration.

The Sylvester method of artificial respiration may be used once or twice daily, executing it very gently, depending upon the age of the patient and the condition present. The stretching of the extended arms may be prolonged; the child's body may be bent toward the sound side at the end of the inspiratory movement.

During breathing exercises, while the patient is lying on the sound side, place your hand under the body; gently raise it as he inhales.

Some writers urge the rule of getting the patient up as soon as possible after a week of exercise in bed, as the ensuing exertion is a desirable aid in lung expansion. We may still, however, have the child take a recumbent position while he takes his breathing exercises. When the child's strength warrants, the deep breathing exercises may be practised while he is sitting and standing.

Osler refers to Naunyn's exercise, patient sitting in an arm-chair with sound side bending over arm of chair, grasping a rung. While holding the rung, forcibly inhale. The same effect is obtained when the deep breathing exercises are combined with the various lateral bending

movements of the body to the sound side, with or without the added combination of arm movements, or the use of the arm only on the affected side. The various breathing exercises should be practised from ten to thirty minutes a day, each exercise being repeated from 5 to 20 times. To avoid overtiring, give a short rest after every two or three minutes of exercise.

Exercises.—*Standing.*—1. Deep inhalation, full exhalation, arms hanging.

2. Deep inhalation, full exhalation, hands back of head.

3. Deep inhalation as arms are raised sidewise, shoulder height. Exhale as arms are lowered.

4. Deep inhalation as arms are raised sidewise overhead, elbows straight. Exhale as arms are lowered with bent elbows.

5. Flex wrists, but keeping elbows straight; repeat No. 4. In the following exercises the one hand or arm refers to the one on the affected side:

6. No. 2, one hand only back of head, other arm by the side.

7. No. 3, only one hand being raised, other by the side.

8. No. 4, only one arm being raised, the other by the side.

9. No. 5, only one arm being raised, the other by the side.

10. With the hand in position, as in Numbers 6, 7, 8 and 9, inhale deeply, bending toward the sound side.

11. Nos. 6, 7, 8, and 9 to be executed, while carrying the arms to position and at the same time bending the body toward the sound side.

12. Charge to front with leg on affected side (long stride, bending knee). Bend body, touch floor in front of toes with corresponding hand. Flex wrist, with straight elbow, raise arm to overhead position, at the same time inhale. Exhale as you bend forward again to floor, with flexed arm. Repeat from three to five times. Step back to position.

13. Charge to side, inhale as you raise arm sidewise to overhead and bend body to the sound side; exhale as you straighten body and lower arm; repeat three to five times; step back to position.

During this stage of treatment one or another of the following measures, which have been recommended by the various writers, may now and then be used for from five to ten minutes of the exercise period. These are: blowing bubbles and various wind instruments, use of the spirometer and of Wolffe's or James' bottle apparatus. Their use should be limited to adding variety or interest to the treatment of the child.

As the patient's strength increases the various out-of-door exercises and games which more strongly stimulate the circulatory and respiratory apparatus should be made use of. These are: fast walking, hill-walking, rope-skipping,—backward as well as forward,—running, horseback riding, bicycle riding, the various games of tag, ball, and swimming—breast and back stroke preferred—for distance and speed. These exercises should be done with the chest expanded and head erect. Ten to twenty minutes of the breathing exercises should be kept up in addition to the out-of-door exercise, as long as the case needs treatment.

After exercising, a patient should always rest from twenty to thirty minutes in a reclining position.

If the case presents a possibility of the formation of scoliosis, a thoracic support should be worn in the intervals between the treatments,

Fig. 136.—Swing strongly to this position without bending elbows.

Fig. 137.—Key-note position. Arm corresponding to low shoulder is raised. Used to maintain a better position of the spine during certain exercises and marches.

which would keep the trunk in a straight line without interfering with the respiration. The use of a bar and suspension apparatus each day for from five to ten minutes is also advised as a preventive measure.

EMPHYSEMA

While the physical changes of emphysema are usually not marked in children, ten to twenty minutes a day of the following exercises will prove of benefit, even in such cases.

The patient should avoid strain or overfatigue.

In order to facilitate exhalation without alveolar strain, all forced exhalations produced by exertion or used as special exercises should be done with the mouth open.

While expiratory exercises are indicated in emphysema, inspiratory exercises are also of value, as they aid in maintaining the functional power of the unaffected portions of the lungs, and in consequence the patient suffers less from dyspnea.

In marked cases of emphysema the breathing is mainly diaphragmatic. Any impairment of, or interference with, the action of the diaphragm brings on dyspnea. Practice and improvement of abdominal breathing are of value.

A distended or bulging chest-wall may be supported by a tight elastic band covering the ribs from the axilla down.

Frequent short periods of rest in bed lessen the accumulative products of exertion.

Respiratory Exercises with Manual Aid.—1. The *Sylvester* and *Satterthwaite methods* of artificial respiration may be used from two to five minutes twice a day. Expel as much air as possible by pressure.

2. Patient lying on his back, stand by his side with your hands on either side of his chest. After he has inhaled as completely as possible, he slowly exhales through the open mouth; at the same time presses alternately with hands from the base of his lungs to the apices. He ejaculates "ah!" with each pressure until his exhalation is completed. Practise five to ten minutes a day.

3. *Gerhardt's Method.*—With your hands on the side of patient's chest, press both sides of the chest as the patient exhales ordinarily. Repeat 20 times per minute for ten minutes, three or four times daily.

4. *McKenzie's Method.*—With a four-inch support (roll of cloth) under patient's lower thorax, his hands under his head, and his chest expanded in inhalation, facing the patient's chest press both sides of his thorax, the patient exhaling at the same time. Repeat 10 times a minute from two to four minutes.

Active Exercises.—*Deep Breathing* (*Standing*).—1. Inhale as arms are raised sideways upward, elbows straight. Exhale as arms are lowered sideways downward. Repeat 5 to 10 times.

2. Inhale as arms are raised forward upward, elbows straight. Exhale as arms are lowered forward downward. Repeat 5 to 10 times.

3. Arms overhead. Exhale as you bend forward and touch floor. Inhale as you raise upward and bring arms to position overhead. Repeat 5 to 10 times.

4. Sitting, inhale through nostrils as much as possible; lean a little forward as you exhale through the mouth. Repeat 5 times.

5. Lying on back—abdominal respiration. Hands back of neck; draw as much air in as possible through nostrils; the abdominal wall expanding forward throughout the inhalation, the upper thorax not expanding; exhale. Practise the abdominal respiration also while sitting and standing. Repeat 5 to 10 times in each position.

Development of the Accessory Muscles of Expiration.—*Thoracic*—1. *Standing Position.*—Arms flexed, hands at the sides of the shoulders, strike strongly the ulnar borders of the hands together, in front of chest. Repeat 10 to 25 times.

2. Arms extended sideways, shoulder height. Swing arms strongly forward, crossing each palm slapping the opposite shoulder. Repeat 10 to 25 times.

3. Arms extended overhead. Full arm circle. Arms crossing inward as a swing is made strongly downward and up sideways to overhead. Repeat 5 to 15 times.

Abdominal.—1. *Lying on Back.*—Raise body to sitting position. Repeat 2 to 5 times.

2. Raise both legs up to a perpendicular position without raising the hips from the floor. Repeat 2 to 5 times.

3. Flex both thighs upon abdomen, the legs being flexed on the thighs at the same time. Repeat 2 to 10 times.

4. If Nos. 1, 2, and 3 are too difficult, then alternate raising; right leg to perpendicular, lower; left leg to perpendicular, lower. Repeat 6 to 20 times.

The exercises should be practised twice a day. Beginning with fifteen minutes, the time may be extended until the patient is taking thirty minutes twice a day as he becomes stronger. Better exercise slowly. When beginning to tire, rest for a few minutes.

Compressed-air Bath and Rarefied Air Apparatus.—These methods of treating emphysema have been of value in treating adults. They are not practical with young children. If apparatus is accessible, they might be tried with older children. Exhalations into a rarefied air apparatus increase the amount of air exhaled and make the breathing easier. The Waldenberg apparatus is one of the best. The compressed air bath, while apparently not as suitable a measure of treatment, has really proved of greater benefit, in that it benefits by aiding in the removal of the causes of emphysema, viz., bronchial catarrh and spasm. It increases the vital capacity and respiratory force. A course of from 20 to 30 baths are usually given, each bath lasting two hours; during the first half-hour the pressure is increasing and then the maximum pressure is maintained for an hour, and during the last half-hour the pressure is gradually reduced to normal. The lessening dyspnea and general benefit derived from a course of baths remain for a considerable period of time after such a course has been finished.

CONGENITAL ATAXIAS

The ataxias of childhood, to which we refer, are *hereditary cerebellar ataxia* and *hereditary spinal ataxia.* Most observers have described them as beginning to develop at the age of eight or ten years; one or two observers have mentioned a much earlier period, stating that the symptoms generally appear at the age of three or four years, and that the cases may be congenital.

Cases upon which this treatment is based were congenital; the de-

velopment of the physical movements was retarded and defective from the beginning, and in one case of hereditary spinal ataxia the physical act of nursing was also defective.

Hereditary cerebellar ataxia is characterized by the involvement both of the upper and lower limbs at the same time, although the upper limbs may not be ataxic to the same degree as the lower. The gait is reeling, uncertain, with the feet wide apart, body bent forward, the weight of the body being supported mainly upon the balls of the feet, the toes inclining inward, locomotion at times being interfered with by the crossing of the legs. One leg is usually more ataxic than the other. The reflexes may be increased. The speech is hesitating, defective, and explosive, but audible.

Hereditary spinal ataxia (*Friedreich's ataxia*) is characterized by its beginning in the lower limbs, gradually extending to the upper limbs, and finally involving the organs of speech. The symptoms are vertigo; swaying from side to side on standing; marked muscular weakness, especially of the extensors and abductors (paralysis may follow); contractures of the flexors and adductors; scoliosis and talipes resulting, first, postural, through muscular weakness, later becoming fixed; rheumatoid pains; and diminution or loss of the patellar reflex. The head is held to one side in a clonic spasm, but turns from one side to the other every day or two. One leg is more ataxic than the other. The movements are characterized by rigidity and incoördination; the articulation is scanning and explosive, and oftentimes, for days, the patient cannot speak above a whisper.

Dana states that there may be a *mixed* or *transitional* hereditary cerebellar and spinal ataxia.

Some observers state that there is defective mentality, and that the patients possess a violent temper. I have not found either to be true—the temper being no different from that which one would find in a little patient otherwise ill for as long a period, and who was not perfectly understood. The speech, or the poise of the head, may suggest deficient mentality, but I have found these children affectionate, observing, and rational, and showing hereditary indications of brightness in mechanical, mathematical, or methodic lines.

In beginning treatment, study the patient's capability for coördinate action. Do this throughout the entire course. When you have decided upon the exercises to be given, show them to the patient in detail, explaining them fully, so that he may understand what effort is required, and occasionally, in teaching, repeat these illustrations and explanations.

Accuracy is of the first importance. If there is lack of control in movement, pause and hold patient in correct position while you count from one to four or ten before resuming movement. Follow that practice as long as it is necessary, and at every tendency toward losing control. Slow and accurate work first, later more rapid work.

While learning an exercise of coördination permit patient to use his eyes to watch his limbs, in order that the coördinate centers may thus be reinforced or aided. Next rely only upon his muscular sense for

correct execution, and at last have the eyes closed in order to eliminate the relationship of surrounding objects, which might aid in the execution. A reclining posture is assumed for coördinate training, where the patient is unable to stand.

Do not expect a child to coöperate with you in attention or efforts to make his physical movements accurate when he is left to himself, for it is rarely done. The coördination must become reflex. The training must be carried to the extent of unnecessary capability. "The keynote" must be, as with the orthopedist, overcorrect, for the correct execution of work under observation would not be sufficient to insure coördinate action the moment a child attempts to do things alone, or when he is tired, or when his attention is given to other objects.

The aim in treatment should be in keeping with a child's natural sphere in life. Childhood is the time of muscular activity and growth; it is the period of play and games. When a child is able to play at all, if left to himself he will not stop for rest, when he begins to tire or fall; he will do so only when the game is ended and his companions finish. Play, therefore, serves only to increase the incoördination, because of overexertion. To make a child capable of walking or running at all, makes him eager to play when others play; but it is like the fencing or boxing of two men, one of whom completely outclasses the other, whose native quickness and strength are completely overcome, so that he has neither the opportunity to show them nor the mind to use them. The ataxic child, in playing with normal children, besides tiring more quickly, being outclassed, becomes bewildered and cannot seize the opportunity to attempt coördinate action.

No satisfactory results can be expected from the treatment of ataxia unless it is continued until the child is able to play as well as other children. The treatment should be made practical as soon as possible. Do not spend unnecessary time on gymnastics or apparatus. When a child shows that he is able to take one step, begin walking exercises, going up and down stairs, and running.

Study the patient's movements, and analyze his defects in execution. To tell a child not to fall when he is walking, and expect him to be able to avoid falling, is not fair to the child. He does not know why he falls, and his attempts to avoid it only increase his general nerve tension. His falling may be due to one of several causes: it may be that he is walking with his feet widely separated; if so, he gets but little support from the advancing foot, and upon fatigue, diverting of attention, or striking a small obstacle, he will fall. When he permits his feet to separate, he should at once be directed to keep them close together. By so training the child it will become easier to keep his feet in position, and, if there is no other defect, falling will unconsciously be avoided. So all of his work must be analyzed to discover its weaknesses or defects.

General gymnastics have no place in the treatment of ataxia, but where certain groups of muscles are weak, movements may be given to strengthen them, in order that they may do their part in coördination. Throughout the greater part of the treatment I have used exercises for

strengthening certain groups of muscles, although their primary value was not to improve coördination. It is well to have these movements executed against resistance, in order to determine the amount of muscular power the patient possesses.

Coördinate efforts at balancing and walking are first made upon the floor until the child shows a little improvement, but it is difficult to make a child realize the necessity for using all of his energies in the effort, when he knows that there is no particular danger; therefore apparatus is necessary to force coördination. Boards, blocks, and ladders (see Fig. 124) are used, not for the purpose of developing ability to perform exercises upon them, but to develop unconsciously the habit of constant care and watchfulness, as the child can readily appreciate the fact that, without such precaution, he will slip and fall; and also learns that he cannot relax, whenever he is inclined to do so, as he might were he on the floor. By this apparatus work, children unconsciously acquire the ability to control themselves in places of danger into which their play leads them.

Always place some incentive before the child as otherwise he rarely puts forth the necessary exertion. His interest, attention, and muscular and nervous energy must be exerted. Tell him that it is necessary to do a certain amount of work before the treatment is over; that, when a certain amount is done, the treatment for the time will be over, whether the hour is up or not. Tell him that he must do something more than he did the day before, whether it takes longer than the hour or not. If it takes longer than the hour, he will learn that you mean what you say, and sometimes the entire work of the hour will be executed in the last few minutes, despite the fact that the fatigue of the previous efforts makes it more difficult.

While we wish to avoid fatigue, a certain amount is harmless. If a child remains fatigued at the end of an hour's rest, following the treatment, and he does not coördinate as well as before the treatment, provision should be made for more rest during the next treatment. A child's inertia needs to be overcome in spite of fatigue. The treatment will teach him that merely saying he is tired will not enable him to escape the work. This has been impressed upon me by seeing how, after fifty-five minutes of unsuccessful effort, a child will "pull himself together," as it were, and do a new exercise that may really be difficult, in order that he may be able to leave at the end of the hour.

Never permit a child to suffer a fall or injury during the treatment. Never take any risks with your patient. (See Fig. 138.) Falls cannot be prevented in ordinary walking or running, except by words of caution, which should always be used; however, they should not be used in tests when the patient is endeavoring to see how far he can walk or run before he falls. On the first fall, make him return.

Experience teaches a patient distrust of his ability to do a thing which he has never tried, or, having failed after several trials, he will naturally say he cannot do it, and not wish to attempt it. Confidence must be inspired in him to follow directions unhesitatingly by insisting

upon his accomplishing every task given him, and thus proving his ability to do it, and also by showing him that his interest is yours, and that you have never permitted him to be injured during his unsuccessful attempts.

With a child it is not enough to secure coördinate action, but you must secure endurance along the lines of reflex, coördinate action. Coordinate action with one who is ataxic calls for general tension, and the unnecessary accessory action of groups of muscles is fatiguing, and results in excessive waste of nerve and muscle energy. To teach a child to do his work easily and to carry on prolonged coördinate effort is thus accomplished by the same means. A parallel can be found in a person learning to skate or swim. Here we have a general tension and the gen-

Fig. 138.—Walking on a narrow board several feet above the floor. An advanced exercise in coördination.

eral action of all the muscles of the body—a great waste of energy to prevent one from falling, or going under the water—and even after one has learned how to swim, much of that nervous waste of energy will continue until he has thoroughly mastered the art. Endurance and conservation of energy are very desirable in an ataxic.

After he had been in training for several months one patient walked forward, without stopping, five hundred feet on the top of a fence, and backward one hundred and twenty feet without stopping. The same child walked several miles up and down a mountain-side without stopping, his mind occupied with observation and not applied at all to his walking, save in response to caution. He was able also to run half a mile without stopping or falling. It is not for the purpose of making

the child a long-distance walker or runner that, after he has learned to walk or run properly, the distance is gradually increased to one or more miles, telling him to "take it as easy as possible" without stopping, although when fatigue is noticed sufficient rest should be given. It is common to see normal children of three or four years of age run and play for long periods of time without apparently tiring—our object in endurance exercises is to fit the patient for a child's sphere in life. Gradually the muscles become inured to fatigue, do their work with a minimum expenditure of force, and to a certain extent recuperate while in action.

Short periods of retrogression must be expected occasionally throughout the entire course. When a child is tired, has had excitement, or when he is indisposed, one must expect a temporary loss of coördination. Parents too should be prepared for this, and not be disheartened when it occurs.

The life of an ataxic child should be quiet and free from excitement. Judgment should be used in allowing him to mingle with other children, even though they are members of his own family. When allowed to play, it should be with younger children, if possible, or with his nurse, or mother, until the time of playing with other children is made a part of the treatment, and even then it should be confined to lines permitted by the one in charge. In the intervals, a child needs sufficient quiet and rest, so that he will completely recuperate and be in the best possible condition for the next treatment, as the treatments afford the only hope of restoring him to nerve stability and normal muscular movement. As he improves, however, the daily régime should vary. As a rule, a child should rest, lying down from one-half hour to an hour before treatment, and the same length of time after treatment, and, in fact, at any time during the day when incoördination becomes marked.

Attention to the general health of the child is important. There should be a simple and nutritious diet, careful attention to the bowels, daily bathing, an outdoor life, the treatment being taken whenever possible in the open air. These things should not be neglected, as these patients are apt to have less resistance to disease than non-ataxic children.

Illness does not cause a retrogression except temporarily through the weakness which follows it. With returning health and strength, progress continues.

Coöperation is important. It is more necessary here than in any other chronic ailment. A child will recover in one-half the time if cooperation is conscientiously given by those in charge of the child. For illustration: the child is capable of walking, but walks on the balls of his feet, or crosses his feet frequently, which causes him to lose his balance easily; whenever he does it, if he is called back, no matter what his object may be for going, until he has walked across the floor correctly, the next time he starts to walk it will not be necessary to call him back as many times, and the constant correct walking will gradually make it a reflex habit. If he is permitted to walk incorrectly, it encourages inco-

ordination and a careless habit. The course of nervous stimuli has been likened to the making of a new path in a jungle. Constant use will make it easy to travel, but if the old path of incoördination is used instead, the new path of coördination remains a difficult task for a much longer period of time. The lines of least resistance are followed, and the new path must be made as easy as the old if we would have a child use it.

Treatment should be for an hour daily. More than an hour's treatment is apt to produce general nervous fatigue. An ataxic child may need training along many lines, and the attempts to do one thing correctly may require so long a time that it is unwise to attempt to give work for the correction of all at one treatment. If this is attempted, nothing will be well done in the hour, and the work will only serve to tire the patient and increase the incoördination. It would take a normal person, who could do the movements well, more than one hour to cover all the lines with improvement in each. An hour has been spent in endeavoring to walk a plank once without falling off, but the child did it before the treatment was completed, and the next day he did it twice, so there was evident progress. When one morning hour is given to the lower limbs, work might be mapped out so that an assistant, the mother or nurse, could give another hour, or half hour, in the afternoon to exercises for the arms and fingers, or to massage, which would improve the nutrition of the tissues and the general circulation, so as to insure a better general response of the nerves and muscles. Another half-hour could be spent in training the speech of the child. In this way the correction of the upper limbs and speech could progress at the same time as that of the lower limbs, instead of waiting until after the coördination in the lower limbs is first secured.

Improvement in one line does not imply any special improvement in another. Walking, running, going up and down stairs, jumping, and hopping must each be taken up separately. It is particularly true, in case one is working for improvement in the lower limbs, and little attention is given at the same time to the upper. At the end of the time devoted to locomotion, the ataxia of the upper limbs is but little improved.

Parents and physicians occasionally think that a child will outgrow his ataxia, but this is a mistake.

A patient should hold as good a posture as possible at all times, as the weight of the body is then better adjusted. One or two exercises under Posture should be added to the treatment. The suggestions about clothing, under Posture (p. 775), are especially valuable here.

Five or ten minutes once or twice a day should be devoted to a sitting posture in which the body is held erect, but the limbs relaxed, and every part of the body entirely at rest. This aids greatly in overcoming the nervous instability and irritability, and is a valuable help in securing general nervous control.

When the patient is given his treatment there should be no one else in the room, unless it is one whose presence would aid in securing better attention or work from the child.

There is a difference in the treatment of congenital ataxias and that of locomotor ataxia: In one case the patient is a child, in the other an adult. With the child, between treatments there is little or no coöperation; with an adult there is coöperation. During the period of development a child's sphere is that of play and muscular activity. The adult looks forward only to returning to his business or professional activity, and stops treatment when his proficiency and coördination permit this.

Exercises.—In the beginning, when the child cannot walk, exercises should be taken while lying down. For the lower limbs, they consist of coördinate flexions and extensions, abductions, adductions, and circumductions, actively and against resistance, and of touching certain designated points or objects with the feet separately. In cerebellar ataxia one can more readily advance to the standing exercises, and take foot-placings (floor may be marked for this), stepping out to side, front and back to the ordinary oblique positions, forward and backward. The weight of the body is carried by the advancing foot, so that when the movement is completed the weight rests equally over both feet. Taking a step is now practised, bringing up the other foot to the side of the foot advanced. This is done sideways, forward, and backward. Two or three steps are now attempted, a pause being made after each one until a perfect poise of the body is obtained. This is continued until the child can walk across the room. At this time the defects shown in the walking should receive attention.

The defects in walking or running are usually the following: carrying the weight of the body too far forward; not straightening the knees completely; the reeling gait; the crossing of the legs; walking with the feet separated; turning the toes inward; not lifting the feet sufficiently; not bringing the heels to the ground. As occasion arises, show the child his defects, and caution him against their repetition. In walking and running in the room, repeat the exercise if any faulty execution is noted. Instruct the members of the household, who have charge of the child, never to ignore these defects, but always to insist upon their immediate correction. In the outdoor walking or running, the patient should always be in advance of you, so that his every movement may be observed. It is here that the correction of the defects should mainly take place. The following four movements aid in correction, and should be given every day for quite an extended period, in order that the weakened muscles may be strengthened for the required work of coördination:

(*a*) Drawing up the knees against resistance.

(*b*) Flexing the feet against resistance.

(*c*) Abduction of feet against resistance.

(*d*) Extension of legs against resistance.

In the full extension of the legs, the feet must be kept flexed.

When the child is able to walk across the room, work is begun upon the apparatus: boards from 7 inches down to 1 inch in width by half an inch in thickness and 10 feet in length, of well-seasoned hard wood; a ladder, the sides of which are 1½ by 2½ inches, 10 feet in length, and the rounds ⅞ inch in diameter by 12 inches long, placed 10 inches apart

in the ladder; 24 blocks of wood, 2 inches in thickness and 12 inches wide by 14 inches long. Beginning with the 7-inch board, have the child walk over and back, with the arms in different positions, the eyes open and the eyes shut; one end of the board placed upon one block, and so on until one end is resting upon ten or more superimposed blocks. The board is placed upon supports of equal height, beginning with one block under each end, increasing the height until the board is about five feet from the ground. At each increase in height the various exercises are repeated. (See Fig. 139.) Two five-inch boards can be used when placed upon the same supports, the boards being about eight or ten inches apart. The child can step from one board to the other, going from one end to the other; and, standing in the center, he can step forward and backward from board to board. With boards placed together, walk forward and backward, the boards bending unevenly as one foot is on each board.

Using the blocks alone, arrange them for walking, at varying distances from each other; also make piles uneven in height, and have patient walk on the blocks with the eyes open and the eyes shut.

Ladder Exercises.—Ladder flat on the ground, walk forward in the spaces between the rounds; walk sideways and walk backward. Place one end of the ladder upon a block and add blocks gradually until the ladder reaches the height of the child's knee; then begin with both ends of the ladder placed on single blocks, gradually increasing the height until the ladder reaches the height of the knee; after each change of height the walking exercise forward, sideways, and backward is repeated. When using the blocks the child may bring them from the pile and build the steps that he is to walk upon; standing upon the block previously placed upon the floor, he bends forward, placing in position the one he carries, repeating the process until all the blocks are arranged. When through walking over the blocks, he stands on the one next to the last one placed, bends over and picks up the last one, and may carry it back to the pile, walking over the blocks, or he may lift and raise it above the head, and pass it, either forward or backward, to you. The block may be carried by the child walking through the spaces of the ladder, and both ladder and blocks may be arranged in various forms to be walked over by the child.

You may now take up the balancing work, where the weight of the body is carried on only a portion of the sole of the foot, as in walking on the rounds of the ladder. The ladder is first placed flat upon the ground, and the walking is done forward and backward. This is graded by raising one end of the ladder until the child can walk up and down on the rounds several times without a mistake, the ladder raised to an angle of 35 degrees. (See Fig. 139.)

In beginning the treatment, the child is instructed not to allow one foot to step directly in front of the other. By this time coördination is sufficiently mastered so that balancing as an exercise may be taken up, using the boards from 2 inches down to one inch in width. On these

boards the child must place one foot in front of the other, and walk forward across it; next, walk backward, eyes open and eyes shut.

When a child is able to walk 50 or 60 feet without falling or stopping to rest, the distance is gradually increased in outdoor walks, correcting defects when noticed, until he can walk a mile or more without their occurrence or without falling.

Fig. 139.—Walking on rounds of ladder, one end raised several feet above floor—an advanced exercise in coördination.

When the patient is able to run across the room in a straight line, teach running in a circle. Watch closely his running and do not allow the feet to be widely separated, or the weight of the body to incline too much forward. He should run with a firm stride and raise his feet well. Increase distance until he can run half a mile without falling or stopping to rest. Later, teach running up and down hill; running short distances, as from 80 to 100 feet, as fast as he can, and stopping without falling; trying to catch a person; racing with another child, who starts at a sufficient

distance behind him, so that they will finish at about the same time; running to catch a person who will dodge and run zigzag and in circles, playing with other children in running games, such as "cross-tag," "pull away," etc., having the other children so handicapped that by exerting himself to the utmost he will not be caught. During these games, if he falls, he should be obliged to run around the grounds once alone.

Other indoor exercises are: whirling on one foot 50 times without falling; repeat on the other foot; alternate thus with eyes open and eyes shut; running in a short circle 50 times without falling. Such exercises are helps to the running out-of-doors. Another helpful exercise is running several hundred feet out-of-doors, whirling around in the direction indicated without falling whenever the command "turn right," or "turn left," is given.

Walking Up and Down Stairs.—Begin with one or two steps and gradually increase until the length of the flight is reached, seeing that the feet are not separated, but that they advance in straight lines directly in front of the body. In walking up stairs, carry the weight of the body over the foot that is on the upper stair. In walking down stairs, be sure that the heel is brought against the back of the stair, so that the foot at no time will rest on the edge. Keep the hands close to the sides of the body while walking up and down stairs with the eyes shut. Run up and down stairs with the eyes open and again with eyes shut, carrying articles while running. One should always be near enough to the child for his protection in case of accident. The object is to train the muscular sense and make the coördination sufficiently reflex to enable the child to run or walk up the stairs alone without the danger of an accident.

Jumping.—Draw a line with a piece of chalk; teach the child to incline his body slightly forward, bending knees a little, spring forward, aided by an upward swing of his arms. Jump for height and distance over the rounds of the ladder, from one space to another, and repeat, skipping one space. Jump from block to block, the blocks being separated at varying distances. Jumping over blocks; running and jumping.

Hopping.—Hopping is much more difficult, as the spring is from one foot alone, and the landing on the same foot. In addition to the coördination necessary to balance upon one foot, are added the required effort to lift the body from the ground and the coördination required for balancing the body on landing, so as to avoid falling. The training is about the same as in jumping; hopping with either foot over a string; hopping for distance; hopping for height; and making a succession of hops on the same foot, without touching the other foot to the ground; the running hop.

At the close of these exercises it may not be amiss to repeat what was stated at the beginning, that it is not desired to make the child an athlete, but distance walking, distance running, fast running, jumping, and hopping are exercises which children use in their play for long periods of time, and the coördination secured by the apparatus work is

often of value in places of danger, where their play is often apt to lead them. Coördination to this degree should be secured.

Exercises for the Upper Limbs.—In the beginning, the general movements of the fingers, wrists, forearms, upper arms, and shoulders may be practised, executing them slowly until the coördination is perfect in these movements. The above exercises are simple movements of flexion, extension, rotation, and circumduction. The educative movements, however, have mainly to do with the fingers:

1. Flexing and extending the fingers.

2. Slowly and gently touch the tip of the thumb to the tip of each finger and hold them together without pressure while five is counted.

3. Simultaneously touch the tip of each finger to the tip of the thumb.

4. Flex strongly the index-finger so that the end will touch the base of its second metacarpal bone.

5. Flex strongly and adduct the thumb so that the tip of the thumb will press the tip of the little finger.

6. Flex strongly and adduct the thumb so that its tip will press the base of the little finger.

7. Needles: have them graded from the largest to the smallest size, grasp a fine thread between thumb and each finger of one hand in turn, and thread each needle; repeat, using the other hand.

8. Buttons: have them graded from the largest to the smallest obtainable, and have them sewed on to one strip of cloth, another strip of cloth having buttonholes to correspond. Practise buttoning and unbuttoning with thumb and index-finger of each hand.

9. Pins: picking them up with fingers. Pick up the pins and press them through a stiff pasteboard box, forming various designs.

10. With a pencil correctly held, make squares, triangles, parallel lines, etc., with and without dots as a guide.

11. With a pencil correctly held, make figures and letters, both large and small.

The child can also use the exercises of piling coins and chips, touching hanging balls, placing pegs in holes, and similar games. Also throwing and catching a ball. A child should be made to dress and undress himself, and to feed himself, although as exercises, at the beginning, he may do them only in part.

In eating, the spoon or fork should never be full, and the cup or glass should be only partly filled. The execution of the movements should be slow.

For incoördination of the neck muscles (more often a part of choreic ataxia) the shot-bag exercises (p. 779) are of value. They should be preceded by a course of simpler exercises.

Exercises for the Speech.—A child should be taught to enunciate numbers and letters distinctly. An interesting book should be read to him, reading one or more words at a time, and requiring him to repeat them correctly after you.

Friedreich's Disease.—In a well-marked case, begin treatment with massage to improve the nutrition of the weakened and atrophied muscles and to help relax the spasm in the contracted muscles. In connection with the massage, passive exercise of the limbs is given and gradual and persistent extension is made upon the contractures, endeavoring to gain a little each day until the limbs are fully extended; then increase from day to day the time during which the limb is held at full extension and abduction. The degree of motion in the joints is utilized by giving active movements. In order that the muscles may become stronger, slight resistance is given to these movements, and greater attention paid to the strengthening of the weaker groups of muscles. When the muscles have moved the limbs as far as possible, the extension must be completed by stretching or by pressure. A child should be taught how to turn over, after pushing up his arms out of the way. When lying prone he should try to draw up his knees under his body, and when his arms become flexible enough and strong enough, he should raise up his body until he rests on his hands and knees; later he is required to raise himself until he is sitting upon his legs, which are flexed underneath his thighs. Have patient raise his body from a reclining to a sitting posture, with legs extended. Let him sit in a chair which is low enough to permit him to place his feet upon the floor, but without any supporting arms. Let him rise from a sitting to a standing posture by drawing back his feet underneath him, and inclining his body slightly forward, then straightening up to a standing posture. Have him balance, upon standing, from a few seconds to several minutes, stretching his body up to its full height. Give foot-placings, then let him attempt a few steps, pausing after each step to strengthen up, balance, and "make himself tall." From this point the treatment is the same as that of the ataxia of the cerebellar type, except that the massage and work for overcoming the contractures must be continued indefinitely, or the progress will be slower.

ANTERIOR POLIOMYELITIS

Exercises should include action of all the groups of muscles of the limbs. The exercise of the muscles that are normal, or but little impaired, stimulates the nutrition of the neighboring impaired muscles.

With the patient in a reclining position the thighs may be flexed, extended, abducted, adducted, and circumducted against resistance when possible. The leg may be flexed and extended, and the foot may be flexed, extended, abducted, and circumducted. These movements may be passive at first; later, when possible, they may also be taken standing. Flexion and abduction of the foot and extension of the toes are results which will come last.

A faint response is sometimes seen after friction over the superficial points of the nerves supplying these muscles, or when the limb is immersed in hot water, and when this response is seen the movements should be completed passively. As the muscles show signs of returning functions, the movements are repeated frequently during the day, but

always stopped when the responsive motion becomes weaker, in order that fatigue may be avoided. When possible, the lightest resistance should be given, so that the power of the muscles may be better ascertained, and their work thus gradually increased by increasing the resistance. An added stimulus may be given by having the normal limb execute the movement with the paralyzed limb. Occasionally, movement is secured in all but one toe. Where there is improvement in any way in the paralyzed limb the treatment should be continued, for cases have shown that muscles may respond to treatment even though there may be no faradic reaction for more than a year.

When the patient is able to walk, walking and marching exercises should be taken up, such as walking on straight lines to and from certain objects, walking on the toes, walking with the arms sideways shoulder high, and with arms in a vertical position. The blocks, boards, and ladder that are used in treating ataxic patients, previously described, are of use here. The use of a trough or of a narrow ladder with sides 6 or 8 inches in width serves to help the patient overcome the outward throw of the paralyzed leg. Although the dimensions of the ladder are different, the walking exercises outlined in the treatment of ataxia may be followed in part. In walking, the patient should endeavor to keep the foot flexed as much as possible, touching the heel first in bringing down the foot. The following may also be given: walking on the heels for a short distance; jumping; climbing a ladder, using hands and feet; running (but do not permit an outward throw of the paralyzed leg—it must advance straight forward); hanging from a bar, swinging both legs forward, sideways, and backward, keeping heels together, and with feet apart. A light basket-ball or foot-ball may be used for kicking. Have patient practise the drop-kick, and show you how hard he can kick.

Exercises for the Arms.—Flexion, extension, abduction, adduction, and circumduction of the upper arm; flexion, extension, and rotation for the forearm and wrist, with and without resistance. Have patient close hand as tight as possible, showing how hard he can strike. Have him catch a basket-ball and practise throwing it into a high basket at different distances. Drop a tennis-ball into his hands to catch; also toss and bound it for him to catch. Have him throw a tennis-ball for height and distance. The tendency is to throw the ball downward. Some of the special finger movements used in the treatment of ataxia, such as approximating the tip of the thumb and the tips of the fingers, the button exercise, the work with the pencil, etc., may also be given.

Passive Exercises.—Where there is any tendency to contracture in the groups of muscles not paralyzed, or in which the degree of paralysis is only slight, passive exercises should be given to secure a normal range of motion of the contracted groups either in leg or arm. This must be kept up throughout the treatment for the purpose of lessening or overcoming the tendency to deformity. Care should be used, however, in not carrying the passive motion beyond the normal range.

Resistance applied to movements of contracted muscles serves to stretch them more than does the passive stretching.

Massage.—Gentle, deep kneading, light clapping, and hacking friction over the superficial points of the nerves and general friction should be given to the entire limb.

Light hacking, vibration, and deep kneading should be given to the spinal muscles.

Fifteen minutes of massage should be given once or twice daily as long as the treatment is needed.

CONSTIPATION

In addition to the measures suggested in a previous section (page 234) for the relief of constipation, gymnastic exercises may be brought into use.

These exercises are given with two objects in view: one, to strengthen the abdominal walls, which mechanically stimulate the intestine; the other, to stimulate the general circulation, which quickens the portal circulation and increases the activity of the liver.

The first five exercises are taken from a reclining position.

1. The knees straight and feet extended. Raise both legs until they are at a right angle with the body.

2. Knees straight. Raise heels about four inches above couch; separate them as widely as possible; bring them together, and lower to couch.

3. Knees straight. Raise heels ten or fifteen inches above the couch. Draw up the knees as close to the chest as possible, without raising heels. Extend the legs without raising or lowering the feet. Lower legs to couch.

4. Feet held, or secured by strap. Raise body to sitting position without use of hands. The hands may be placed upon the thighs, folded upon the chest, placed back of neck, or the arms may be extended beyond the head. Changing the position of arms in the order named increases the exertion.

5. Feet held. Circle trunk sideways, forward, sideways, backward to the starting position, starting to right and left alternately. Arms position as in number four.

6. Hang from bar or round of ladder. Execute No. 1. (The position of body changed, but the relation of legs to body same as in No. 1.)

7. Hanging position. Execute No. 2.

8. Hanging position. Execute No. 3.

9. Hanging position. Heels together, swinging legs from waist, describe as large a circle as possible with the feet.

Each of the above exercises may be followed by a deep-breathing exercise.

In a weak patient, the detail of straight knees need not, at first, be insisted upon. If necessary, the patient may be assisted, the weight of the legs or body being partly supported until the patient is strong enough to execute the movement alone.

10. Sitting on chair or stool. Hands placed back of neck, twist body right and left against resistance.

11. Sitting position. Hands back of neck, bend body right and left against resistance.

Exercises for the General Circulation.—Taken from a standing position:

1. Bend trunk forward, touch floor with fingers, keeping the knees straight.

2. Take a long step forward, bend the forward knee; bend trunk forward; touch the floor with fingers. Raise trunk, step back to position. Alternate feet in stepping.

3. Stand with feet two foot-lengths apart. Raise arms sideways to shoulder height. Bend right knee and bend trunk to right side, touching floor with right hand. Raise body. Same to left.

4. "Chopping." Stand with feet separated, fingers interlaced. Bend body forward, swinging hands to floor between feet. Raise body, swinging hands up over right shoulder, at same time twisting to right. Swing to floor. Same to left.

5. Hop, feet apart, then together, quickly.

6. Run in place—*i. e.*, without advancing.

(*a*) With front of thighs kept in same plane with front of body, heels striking buttocks in running.

(*b*) With each step in running, raise the knees as high as possible in front of body.

The running and hopping should be done quickly, and continued long enough to get the body thoroughly warm.

Passive Exercises.—1. Trunk-rolling. Patient in a sitting position, feet separated and fixed. Grasp him by the shoulders, and with a continuous movement bend the body to the right, forward, left, back to the starting position. After the movement has been given several times, reverse the direction.

2. Thigh-rolling. Patient in a semi-reclining position. Grasp patient's foot with right hand, his leg just below the knee with left. Raise thigh and circumduct it, the knee describing as large a circle as possible.

Exercises with Resistance.—1. Reclining position. Flex and extend thighs.

2. Semi-reclining position, with knees drawn up. Abduct and adduct thighs.

The prescription for treatment may be arranged in this order: active exercises, passive exercises, exercises with resistance, ending with some deep-breathing exercises.

FLAT-FOOT

Flat-foot is a condition in which the ligaments and muscles of the foot are abnormally weak, and in which the anteroposterior arch may be partially or wholly depressed and flattened.

The leg is rotated inward and the foot everted; the weight of the body falls on the inner side of the foot; the interior malleolus is prominent; the entire sole of the foot rests on the floor; and when the feet

are placed side by side and the toes and heels touch, the natural concavity of the inner line of the foot is replaced by a convexity. The patient complains of pain or weakness, and the tissues of the sole are weak and flabby.

There are different methods of examining the outlines of the sole of the foot: standing with the foot on a plate of glass so that the sole of the foot may be seen from beneath; smearing the sole with vaselin and standing on a piece of blotting-paper; smearing it with charcoal and standing on a piece of white paper, etc.

The patient should have proper rest. He should frequently sit with feet elevated and avoid exhaustion. When standing, he should occasionally invert the feet, and, when walking, walk with the feet parallel, as the Indians do, and for short distances walk on the outer borders of the feet.

The feet should be cared for each day, giving attention to the nails and to bathing. Apply hot and cold water alternately, and rub vigorously in order to stimulate the muscles and the circulation.

The feet should be properly clothed; the stockings should be even, smooth, and loose, but should not heat the feet. The shoes should be broad enough to permit free use of the muscles of the feet; the toe of the shoe should point slightly inward, and the inner border may be raised; the heels should be low and broad.

The general condition of the patient should be carefully considered, his general tonicity—for its impairment will affect the condition of the feet. Judgment should be used in the care and use of the feet in rheumatism, and during and shortly after convalescence where there is a general relaxation of muscles and ligaments. Malnutrition and obesity, if present, should receive attention while the feet are being treated.

In severe cases, in the beginning, the patient should be kept entirely off his feet, and given only passive exercises, massage, and bathing.

Exercises.—1. Reclining or semi-reclining position. Extend foot against resistance.

2. Reclining position. Adduct and invert foot against resistance.

3. Reclining position. Circumduct foot inward, upward, and outward with resistance applied to the inward and upward motion.

4. Standing position. Rise on toes.

5. Standing position. Rise on toes; turn heels outward; lower heels slowly to floor.

Passive Exercises.—1. With one hand hold heel firm, at the same time pressing on the astragalus with an outward, upward motion of the thumb, while the other hand adducts, inverts, and flexes the foot. This may be done under hot water if the deformity is marked.

2. Extension of foot.

3. Adduction of foot.

Massage.—Deep kneading, vibration, and clapping may be given to the foot and to the muscles of the calf of the leg.

A gauze pad may be placed under the arch, and held by adhesive

plaster or a rubber bandage, until a well-fitted plate can be made, which should be used for support in the intervals between treatments, until the muscles and ligaments have gained sufficient strength to hold the arch in a normal position.

XXII. DRUGS AND DRUG DOSAGE

DRUGS FOR INTERNAL USE

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Acetanilid.				
Not advised in the treatment of children.				
Acid, Arsenious. See *Arsenic.*				
Acid, Benzoic. Benzoic acid; flowers of benzoin.				
Used in cystitis of alkaline type	1 gr.	1–2 gr.	2 gr.	3–5 gr.
Acid, Gallic.				
Bismuth subgallate. (Dermatol.)				
Used internally as an intestinal astringent, also externally	3–5 gr.	5 gr.	10 gr.	10 gr.
Acid, Hydrochloric, Dilute. (Corresponding to 31.9 per cent. of absolute HCl.)				
Used in chronic gastritis with atony of the stomach	¼–½ drop	1 drop	2 drops	3–5 drops
Acid, Lactic.				
Used in fermentative diarrheas. Given best well diluted with syrup and water and at two-hour intervals	..	1 drop	2 drops	3–5 drops
Acid, Phosphoric, Dilute. (Containing 10 per cent. orthophosphoric acid.)				
Used as a stomachic	1–2 drops	2–3 drops	5 drops	10 drops
Acid, Salicylic.				
Seldom used uncombined.				
Bismuth subsalicylate.				
Intestinal astringent and sedative	1 gr.	1–2 gr.	2 gr.	3–5 gr.
Methyl salicylate. (Synthetic oil of wintergreen.)				
Antirheumatic	1 drop	2–3 drops	3 drops	3–5 drops
Oil of wintergreen. (Natural.)				
Antirheumatic	1 drop	2–3 drops	3 drops	3–5 drops
Salol. (Phenyl salicylate.)				
Intestinal antiseptic and antirheumatic	½ gr.	1–2 gr.	2 gr.	3 gr.
Sodium salicylate.				
Antirheumatic	1 gr.	1–2 gr.	2–3 gr.	3–5 gr.
Aspirin. (Non-official.) (Acetyl-salicylic acid.)				
Antirheumatic—a substitute for sodium salicylate, being less irritating to the stomach. Best given in capsules, for it is decomposed by alkalis and by moisture	1 gr.	1–2 gr.	2–3 gr.	3–5 gr.
Acid, Tannic.				
Used in the form of:				
Tannalbin. (Dried albuminate of tannin.)				
Used as an intestinal astringent	1–2 gr.	1–2 gr.	2–3 gr.	3–5 gr.

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Acid, Tannic (*Continued*).				
Tannigen. (Acetyl-tannin.) Used as an intestinal astringent. Also by rectum: 1 per cent. solution of tannic acid in an enema, for dysentery or colitis.	1–2 gr.	1–2 gr.	2–3 gr.	3–5 gr.
Acid, Tartaric. Seldom used except as one of its salts.				
Potassium bitartrate. (Cream of tartar.) Diuretic, refrigerant, and aperient. Used as an ingredient of diuretic drinks. To one pint of water to be drunk in twenty-four hours is added:	..	2 dr.	..	4 dr.
Potassium and antimony tartrate. (Tartar emetic.) Used as an expectorant. Its action is too violent for use as an emetic. Best given alone or with ipecac in a tablet or in a mixture with a simple elixir. May cause severe gastro-enteritis in too large doses.	$\frac{1}{200}$ gr.	$\frac{1}{150}$ gr.	$\frac{1}{100}$ gr.	$\frac{1}{100}$ gr.
Potassium and sodium tartrate. (Rochelle salt.) Laxative.	15 gr.	30 gr.	1–2 dr.	3–4 dr.
Aconite. (Aconitum napellus.) (Root contains 0.5 per cent. aconitin.) *Tincture of aconite root* (10 per cent.). Used in a beginning fever as a circulatory sedative and an analgesic.	½ drop	¼ drop	1 drop	1–2 drops
Alcohol. (Ethyl alcohol, spirits of wine.) Best given as whisky or brandy for a general stimulant toward the end of an illness or as a last resort.				
Brandy. (Spiritus vini gallici, containing 39–47 per cent. alcohol by weight.)	5-10 drops	10–20 drops	20–30 drops	30–40 drops
Whisky. (Spiritus frumenti, containing 44–50 per cent. alcohol by weight.)	5-10 drops	10–20 drops	20–30 drops	30–40 drops
Sherry wine. (Vinum xerici, containing alcohol, 15–20 per cent., by weight.)	..	30 drops	45 drops–1 dr.	1–2 dr.
Aloes. Not advised in the treatment of children.				
Alum. Not advised in the treatment of children.				
Ammonium.				
Ammonium bromid. See *Bromin.*				
Ammonium chlorid. (Sal ammoniac.) Stimulating expectorant; best given dissolved in half an ounce of water.	¼ gr.	¼–½ gr.	1 gr.	1–2 gr.
Ammonium carbonate. (Sal volatile.) Stimulating expectorant; best given dissolved in half an ounce of water.	¼–½ gr.	½–1 gr.	1 gr.	1–2 gr.
Solution of ammonium acetate. (Liquor ammonii acetatis or spirits of Mindererus.)				

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
AMMONIUM (*Continued*).				
Stimulating expectorant; best given well diluted in carbonic water.				
Used also as a diuretic, antipyretic, and diaphoretic	..	½–1 dr.	1 dr.	2 dr.
Aromatic spirits of ammonia. (Spiritus ammonii aromaticus.)				
Used as a stimulating expectorant, volatile stimulant, carminative, and antispasmodic. Best given well diluted with water	3 drops	3–5 drops	5 drops	5–10 drops
ANTIMONY.				
Antimony and potassium tartrate. (Tartar emetic.) See under *Acid, Tartaric.*				
ANTIPYRIN.				
Analgesic and sedative in pertussis and laryngitis.				
Best given alone in powder form, or with sodium bromid in solution	½ gr.	1–1½ gr.	2 gr.	3 gr.
ANTITOXIN. See *Serum, Antidiphtheric.*				
APOMORPHIN.				
Not advised in the treatment of children.				
ARSENIC.				
Arsenious acid. (Arsenic trioxid or white arsenic.)				
Used in anemia, malaria, and chorea.				
Administered either in solution (see Fowler's solution) or in tablets with other ingredients.				
In large doses it is an irritant poison, causing puffiness of the eyes and gastroenteritis, both of which are signs of an overdose.				
Cannot be given with astringents, tinctures, or decoctions or with solutions of iron.				
Antidotes are hydrated iron with magnesia, egg-albumen, and emetics.				
Given three times a day	..	$\frac{1}{200}$ gr.	$\frac{1}{150}$ gr.	$\frac{1}{100}$ gr.
Fowler's solution. (Liquor potassii arsenitis.)				
Uses, action, and antidotes are the same as those of arsenious acid.				
Best given in water into which it is freshly dropped	½ drop	1 drop	2 drops	2–5 drops
ASAFETIDA.				
Emulsion of asafetida. (Milk of asafetida.)				
Used chiefly as an ingredient of enemata, especially in excessive tympanites.				
To 8 ounces of diluent	..	1 dr.	1 dr.	1 dr.
ASPIDIUM. (Male-fern.)				
Oleoresin of male-fern.				
Teniafuge.				
Best given in emulsion or in capsules	..	..	10–15 gr.	20–30 gr.
ASPIRIN. See under *Acid, Salicylic.*				

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Atropin. See under *Belladonna.*				
Basham's Mixture. See under *Iron.*				
Belladonna. (From the leaves of the *Atropa belladonna,* containing 0.35 per cent. of alkaloid.)				
Atropin. (Alkaloid of belladonna.) Respiratory stimulant, antihidrotic. Used as a stimulant, a mydriatic, and for the cure of enuresis	$\frac{1}{300}$ gr.	$\frac{1}{300}$ gr.	$\frac{1}{250}$ gr.	$\frac{1}{200}$ gr.
Tincture of belladonna (10 per cent. leaves). Uses similar to those of atropin	$\frac{1}{4}$–$\frac{1}{2}$ drop	1 drop	1–2 drops	3–5 drops
Belladonna leaves. (Asthma powder.) Used occasionally with the leaves of conium and stramonium, and potassium nitrate (saltpeter) to relieve attacks of asthma. To be burned in a metallic receptacle.				
Benzoic Acid. See *Acid, Benzoic.*				
Bichlorid of Mercury. See under *Mercury.*				
Bismuth.				
Bismuth subcarbonate. Intestinal astringent and sedative	10 gr.	10 gr.	10 gr.	20 gr.
Bismuth subgallate. (Dermatol.) Intestinal astringent and sedative. Used also externally	3–5 gr.	5 gr.	5–10 gr.	10 gr.
Bismuth subnitrate. Intestinal astringent and sedative	5–10 gr.	10 gr.	10–15 gr.	20 gr.
Bismuth subsalicylate. See under *Acid, Salicylic.*				
Blaud's Pill. See under *Iron.*				
Borax. (Sodium borate.) See under *Sodium.*				
Brandy. See under *Alcohol.*				
Bromin. Used only in the form of its salts.				
Ammonium bromid. Sedative. Used in laryngismus, pertussis, asthmatic bronchitis, and sleeplessness. Best given well diluted with water	1–3 gr.	2–4 gr.	3–5 gr.	5–8 gr.
Potassium bromid. Used same as the ammonium salt, but it is more depressing	1–3 gr.	2–4 gr.	3–5 gr.	5–8 gr.
Sodium bromid. Used same as the above. It is midway between the ammonium and the potassium salts in its depressant action	1–3 gr.	2–4 gr.	3–5 gr.	5–8 gr.
Strontium bromid. Used same as the above	1–3 gr.	2–4 gr.	3–5 gr.	5–8 gr.
Brown Mixture. See under *Licorice.*				
Caffein.				
Caffein sodiosalicylas (50 per cent. caffein)	$\frac{1}{2}$ gr.	$\frac{1}{2}$–1 gr.	1–1½ gr.	1½–2 gr.
Caffein sodiobenzoas	$\frac{1}{2}$ gr.	$\frac{1}{2}$–1 gr.	1–1½ gr.	1½–2 gr.
Citrate of caffein (50 per cent. caffein). General stimulant and diuretic	$\frac{1}{2}$ gr.	$\frac{1}{2}$–1 gr.	1 gr.	1–2 gr.

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
CALCIUM.				
Calcium chlorid.				
Of some benefit in hemophilia and purpura hæmorrhagica	½ gr.	1 gr.	1–2 gr.	2 gr.
Calcium lactate	5 gr.	10 gr.	20 gr.	20 gr.
Calcium sulphid.				
Antipustulant	1/30 gr.	1/20 gr.	1/10 gr.	1/10 gr.
Prepared chalk.				
Antacid	2 gr.	3 gr.	5 gr.	5–8 gr.
Compound chalk mixture. (Mistura cretæ composita.)				
20 per cent. chalk powder, 40 per cent. cinnamon-water.				
Antacid. Every two hours	1 dr.	1 dr.	1½ dr.	2 dr.
CALOMEL. See under *Mercury.*				
CAMPHOR.				
Powdered camphor.				
Used in coryza. Every two hours	1/10 gr.	1/5 gr.	¼ gr.	¼ gr.
Spirits of camphor (10 per cent. in alcohol).				
Stimulant, anodyne, carminative	3 drops	5 drops	5–10 drops	10 drops
Water of camphor. (Aqua camphoræ.) (Contains 0.8 per cent. of camphor.)				
Used as a vehicle.				
CANTHARIDES.				
Used best in:				
Tincture of cantharides (10 per cent.).				
Useful in cystitis and functional albuminuria	..	..	¼–½ drop	½ drop
CAPSICUM.				
Used best in:				
Tincture of capsicum (10 per cent.).				
Used as a carminative and stomachic.				
Best given well diluted in water	..	1 drop	2–3 drops	3–5 drops
CARDAMOM.				
Used best as:				
Tincture of cardamom.				
Used as a carminative	5 drops	10 drops	15 drops	20 drops
CASCARA SAGRADA. (Bark of Rhamnus purshiana.)				
Extract of cascara sagrada.				
(Four times the strength of the bark.)				
Tonic laxative	..	½ gr.	1–2 gr.	3–5 gr.
CASCARA SAGRADA (*Continued*).				
Fluidextract of cascara sagrada. (Aromatic.) (1 c.c. = 1 gm. bark.)				
The active principles are retained, but the bitter principles are eliminated.				
Tonic laxative	15 drops	30–45 drops	1 dr.	1–2 dr.
CASTOR OIL. (Oleum ricini.)				
(Expressed from the seeds of Ricinus communis.)				
Bland and cathartic.				
Given usually for one dose	1 dr.	2 dr.	3 dr.	4 dr.
CERIUM OXALATE.				
Sedative in vomiting	2 gr.	2–3 gr.	3 gr.	3–5 gr.
CHALK. See *Calcium.*				

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Chloral Hydrate. Sedative, hypnotic, and antispasmodic. Best given in some bland fluid by rectum	..	1 gr.	1½ gr.	2 gr.
Chloroform. Given internally as: *Spirits of chloroform.* (Chloric ether.) (6 per cent. chloroform.) Carminative, antispasmodic, and sedative	2–3 drops	3–5 drops	5–15 drops	15–20 drops
Water of chloroform. (Aqua chloroformi.) (0.5 per cent. chloroform.) Vehicle and carminative	½ dram	½–2 dr.	2–3 dr.	4 dr.
Cinchona. See under *Quinin.*				
Cocain, or: *Cocain Hydrochlorid.* Local anesthetic by hypodermic injection. Used in 0.2 per cent. to 4 per cent. strength. But seldom used for local anesthesia in children. Used by the mouth in obstinate vomiting	..	$\frac{1}{100}$ gr.	$\frac{1}{50}$ gr.	$\frac{1}{25}$ gr.
Codein. See *Opium.*				
Cod-liver Oil. (Oleum morrhuæ.) Fixed oil from fresh cod's livers. Alterative and tonic. Given three times a day	10–15 drops	15–20 drops	20–30 drops	½–1 dr.
Corrosive Sublimate. See *Corrosive Chlorid of Mercury.*				
Cream of Tartar. See under *Acid, Tartaric.*				
Creosote. (Beechwood creosote.) Tonic, alterative, and antitubercular. Best given in an emulsion with cinnamon-water, three times a day after meals	½ drop	2 drops	2–3 drops	3–5 drops
Creosotal. (Carbonate of creosote—92 per cent. creosote.) Is preferable to creosote because it has little odor, a more agreeable taste, and is better borne by the stomach	½ drop	2 drops	2–3 drops	3–5 drops
Dermatol. (Bismuth subgallate.) See under *Bismuth.*				
Digitalis. (From the leaves of Digitalis purpurea.) Heart stimulant and tonic; also diuretic. Best given by mouth in the form of the tincture and hypodermically either as the tincture or as digitalin.				
Tincture of digitalis (10 per cent. leaves)	½ drop	1 drop	1–2 drops	2–3 drops
Infusion of digitalis (66 gm. = 1 gm. leaves)	..	..	½–1 dr.	1–3 dr.
Digitalin (10 times strength of leaves).	$\frac{1}{200}$ gr.	$\frac{1}{200}$ gr.	$\frac{1}{150}$ gr.	$\frac{1}{100}$ gr.

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Diphtheria Antitoxin. See *Serum, Antidiphtheric.*				
Dover's Powder. See under *Opium.*				
Epsom Salt. See under *Magnesium.*				
Ergot. (From the sclerotium of the Claviceps purpurea of rye.)				
Hemostatic, heart and circulatory stimulant.				
Fluidextract of ergot (1 c.c.=1 gm. ergot)	2–3 drops	5 drops	5–8 drops	10–15 drops
Eriodictyon. See *Yerba Santa.*				
Ether.				
Used internally as:				
Compound spirits of ether. (Hoffmann's anodyne, 32.5 per cent. ether.)				
Anodyne, carminative, antispasmodic, and stimulant.				
Best given well diluted with water	2 drops	3–5 drops	5 drops	5–10 drops
Spirits of nitrous ether. (Sweet spirit of niter, 4 per cent. ethyl nitrite.)				
Used as a diaphoretic, diuretic and carminative.				
It is volatile and explosive and incompatible with many drugs. Best given alone or in a simple elixir	2–3 drops	3–5 drops	5 drops	5–10 drops
Fel Bovis. See *Ox-gall.*				
Ferrum. See *Iron.*				
Fowler's Solution. See *Arsenic.*				
Gallic Acid. See *Acid, Gallic.*				
Gentian.				
Extract of gentian.				
Stomachic and bitter tonic.				
Given three times a day	..	..	$\frac{1}{4}$–$\frac{1}{2}$ gr.	$\frac{1}{2}$–1 gr.
Glauber's Salt. (Sodium sulphate.) See under *Sodium.*				
Glonoin. See *Nitroglycerin.*				
Glycerin.				
Used chiefly as a demulcent base and a vehicle for other drugs.				
Glycyrrhiza. See *Licorice.*				
Hexamethylenamin. Official name for the proprietary urotropin, *q. v.*				
Hoffmann's Anodyne. See under *Ether.*				
Hydrargyrum. See *Mercury.*				
Hyoscyamus.				
Tincture of hyoscyamus.				
Sedative and antispasmodic.				
Ipecac	$\frac{1}{100}$ gr.	$\frac{1}{75}$ gr.	$\frac{1}{60}$ gr.	$\frac{1}{60}$ gr.
Syrup of ipecac	$\frac{1}{2}$–1 drop	1–2 drops	3 drops	3–5 drops
Iron. Given every two hours.				
Liquor ferri et ammonii acetatis.				
(Basham's mixture—solution of iron and ammonium acetate—10 per cent. metallic iron)	..	..	$\frac{1}{2}$ dr.	1 dr.—
Ovoferrin. (Proprietary organic iron.)	5 drops	10 drops	15–20 drops	20–30 drops
Pyrophosphate of iron (10 per cent. of metallic iron)	..	..	1–2 gr.	2–3 gr.

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Iron (*Continued*).				
Syrup of the iodid of iron (5 per cent. ferrous iodid)	3 drops	6 drops	10 drops	20–30 drops
Tincture of the chlorid of iron. (35 per cent. of ferric chlorid and must be at least one year old.)	1 drop	3 drops	5 drops	10–15 drops
Jalap.				
Powdered jalap. (Contains 8 per cent. resin.)				
Hydragogue cathartic and diuretic	..	..	2 gr.	3 gr.
Lactic Acid. See *Acid, Lactic.*				
Licorice.				
Compound licorice mixture. (Brown mixture—12 per cent. paregoric.) Sedative expectorant mixture. Given at two-hour intervals	15 drops	20 drops	30–40 drops	40 drops – 1 dr.
Compound licorice powder. Laxative	10 gr.	10–20 gr.	30 gr.	40 gr. – 1 dr.
Magnesium.				
Magnesium carbonate. Antacid and laxative	5–10 gr.	20 gr.	30–40 gr.	40 gr. – 1 dr.
Magnesium citrate, solution of. (Liquor magnesii citratis.) Laxative. For one dose	..	..	2 oz.	2–4 oz.
Magnesium oxid. (Calcined magnesia.) Antacid and laxative	5–10 gr.	10–20 gr.	20–30 gr.	30–40 gr.
Magnesium sulphate. (Epsom salt.) Laxative. To be given every two hours and discontinued when the desired effect has been produced	10–15 gr.	20 gr.	20–30 gr.	½–1 dr.
Male-fern. See *Aspidium.*				
Mentha Piperita. See *Peppermint.*				
Mentha Viridis. See *Spearmint.*				
Mercury.				
Mass of mercury. (Blue mass—35 per cent. mercury.) Cathartic and antisyphilitic. Used once a day	..	..	1 gr.	1–2 gr.
Corrosive chlorid of mercury. (Bichlorid of mercury or corrosive sublimate.) Antisyphilitic. Given three times a day	$\frac{1}{200}$ gr.	$\frac{1}{100}$ gr.	$\frac{1}{100}$ gr.	$\frac{1}{75}$ gr.
Mild chlorid of mercury. (Calomel.) Cathartic, cholagogue, antisyphilitic. At thirty-minute intervals	$\frac{1}{10}$ gr.	$\frac{1}{8}$ gr.	..	..
At one-hour intervals	..	..	¼ gr.	¼ gr.
Rarely necessary to give more than one grain for laxative effect.				
Red iodid of mercury. (Biniodid.) Antisyphilitic. Given three times a day	$\frac{1}{150}$ gr.	$\frac{1}{100}$ gr.	$\frac{1}{50}$ gr.	$\frac{1}{25}$–$\frac{1}{10}$ gr.

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Mercury (*Continued*).				
Mercury with chalk. (Gray powder.) (38 per cent. mercury.)				
Intestinal antiseptic, cholagogue, and antisyphilitic.				
At one-hour intervals—total 1 gr.	$\frac{1}{4}$ gr.	$\frac{1}{4}$ gr.	..	..
At one-hour intervals—total 2 gr.	..	..	$\frac{1}{2}$ gr.	$\frac{1}{2}$ gr.
Methyl Salicylate. See under *Acid, Salicylic.*				
Mindererus, Spirits of. See under *Ammonium.*				
Morphin. See under *Opium.*				
Myrrh.				
Tincture of myrrh (20 per cent.).				
Used as a mouth-wash diluted with water.				
Niter. See under *Ether, Sweet Spirits of Niter.*				
Nitroglycerin. (Glonoin, glyceryl trinitrate.)				
Vasodilator	$\frac{1}{400}$ gr.	$\frac{1}{300}$ gr.	$\frac{1}{200}$ gr.	$\frac{1}{100}$ gr.
Spirits of glyceryl trinitrate, or spirits of glonoin, old U. S. P. (1 per cent. alcoholic solution)	$\frac{1}{4}$ drop	$\frac{1}{3}$ drop	$\frac{1}{2}$ drop	1 drop
Nux Vomica. (From Strychnos nux-vomica.)				
Tincture of nux vomica (1 per cent. strychnin).				
Stomachic and stimulant	$\frac{1}{2}$ drop	1 drop	1–2 drops	2–4 drops
Strychnin. (Alkaloid of nux vomica.)				
General stimulant, well borne by children.				
Every two or three hours	$\frac{1}{400}$–$\frac{1}{200}$ gr.	$\frac{1}{150}$ gr.	$\frac{1}{100}$ gr.	$\frac{1}{100}$ gr.
Oleum Gaultherium. (Oil of wintergreen.) See under *Acid, Salicylic.*				
Oleum Morrhuæ. See *Cod-liver Oil.*				
Oleum Olivæ. See *Olive Oil.*				
Oleum Ricini. See *Castor Oil.*				
Olive Oil.				
Laxative and nutrient	15 drops	15–30 drops	30 drops–1 dr.	1 dr.
Used at night by rectum for the cure of constipation	1 oz.	1½ oz.	2 oz.	3 oz.
Opium.				
Sedative, anodyne, hypnotic.				
Tincture of deodorized opium (10 per cent.)				
Used in 3- to 10-drop doses in enemata as a sedative for children under five years of age.				
Camphorated tincture of opium. (Paregoric—0.4 per cent. opium.)				
Sedative and analgesic	3–5 drops	10 drops	15–20 drops	20–30 drops
Powder of ipecac and opium. (Dover's powder—10 per cent. each of ipecac and opium.)				
Sedative	$\frac{1}{8}$–$\frac{1}{4}$ gr.	$\frac{1}{2}$–$\frac{3}{4}$ gr.	1–1½ gr.	2–3 gr.

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Opium (*Continued*).				
Morphin. (Alkaloid of opium.)				
Not well borne by children and best given hypodermatically	$\frac{1}{100}$ gr.	$\frac{1}{100}$ gr.	$\frac{1}{50}$ gr.	$\frac{1}{20}$ gr.
Codein. (Methylmorphin.)				
As sulphate or phosphate	..	$\frac{1}{20}$ gr.	$\frac{1}{10}$ gr.	$\frac{1}{8}$ gr.
Heroin. (Diacetylmorphin.)				
As hydrochlorid.				
Bronchial sedative	..	$\frac{1}{100}$ gr.	$\frac{1}{50}$ gr.	$\frac{1}{30}$ gr.
Orange-juice. (Citrus aurantium.)				
Antiscorbutic	½ oz.	..	..	1 oz.
Ox-gall. (Fel bovis—fresh ox-bile.)				
Used as a laxative in enemata—½–1 dr. to a pint of water.				
Paregoric. *Camphorated tincture of opium.*				
See under *Opium.*				
Pepo. See *Pumpkin Seed.*				
Peppermint.				
Aqua mentha piperitæ—Peppermint water. (0.2 per cent. oil of peppermint.)				
Carminative, sedative, corrective, and vehicle	1 dr.	1–2 dr.	3 dr.	4 dr.
Pepsin.				
Powdered pepsin	1 gr.	1–2 gr.	2–3 gr.	3 gr.
Essence of pepsin	20 drops	30–40 drops	40 drops–1 dr.	1 dr.
Phenacetin. (Acetphenetidin.)				
Antipyretic and analgesic	½ gr.	1 gr.	1½ gr.	2 gr.
Phosphoric Acid. See *Acid, Phosphoric.*				
Phosphorus.				
Oleum phosphoratum (1 per cent. in almond oil).				
Alterative	½ drop	1 drop	1½ drops	2–4 drops
Syrup of hypophosphites.				
(Calcium, 4.5 per cent.; sodium and potassium, each, 1.5 per cent.)	½ dr.	¾ dr.	1 dr.	1–2 dr.
Pilocarpin.				
Not advised in the treatment of children.				
Potassium.				
Potassium acetate.				
Diuretic, refrigerant, and alterative	1–2 gr.	2–3 gr.	3 gr.	5 gr.
Potassium bicarbonate.				
Should not be given to children on account of its disagreeable taste.				
Potassium bitartrate. (Cream of tartar.)				
See under *Acid, Tartaric.*				
Potassium bromid. See under *Bromin.*				
Potassium citrate.				
Diaphoretic and diuretic.				
Used in acute bronchitis	½–1 gr.	1–2 gr.	3 gr.	4 gr.
Potassium chlorate.				
Astringent and antisialogogue.				
Used in stomatitis of every type, in tonsillitis and angina	½ gr.	1 gr.	2–3 gr.	3 gr.
Potassium iodid.				
Antispasmodic and antisyphilitic	1 gr.	1–2 gr.	2–3 gr.	3 gr.

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Potassium (*Continued*).				
Potassium and sodium tartrate. (Rochelle salt.) See under *Acid, Tartaric.*				
Prunus Virginiana. See *Wild Cherry.*				
Pumpkin Seed. Pepo.				
Teniafuge. Best given in an emulsion; average dose, 1 dr.				
Quassia.				
Infusion of quassia.				
Vermifuge.				
An extemporaneous infusion is made by adding 1 or 2 ounces of quassia chips to a pint of water. This is injected high up into the bowel.				
Used particularly to destroy the Oxyuris vermicularis.				
Quinin. (Alkaloid of cinchona.)				
Bisulphate of quinin	1 gr.	1–2 gr.	2–3 gr.	3–4 gr.
Sulphate of quinin	1 gr.	1–2 gr.	2–3 gr.	3–4 gr.
Tincture of cinchona	..	5–10 drops	15 drops	20–30 drops
All these are bitter tonics and antiperiodics.				
Rhamnus Purshiana. See *Cascara Sagrada.*				
Rhubarb.				
Powdered rhubarb.				
Laxative	1–2 gr.	2–3 gr.	3–4 gr.	5 gr.
Rhubarb (*Continued*).				
Aromatic syrup of rhubarb.				
Laxative and flavoring medium	1 dr.	2 dr.	3 dr.	4 dr.
Mixture of rhubarb and soda.				
Corrective and laxative.				
℞. Pulveris rhei,				
Sodii bicarbonatis āā xlviij				
Syrupi rhei aromatici ℥j				
Aquæ q. s. ad ℥ij				
M. Sig.—One to three doses daily	½ dr.	2 dr.	3 dr.	4 dr.
Rochelle Salt. See under *Acid, Tartaric.*				
Saccharin. (Benzosulphinidum.)				
Substitute for sugar, but 200 times sweeter.				
For 8 ounces of food, ½–1 grain is sufficient.				
Saccharose. See *Sugar.*				
Salicylic Acid. See *Acid, Salicylic.*				
Salol. See under *Acid, Salicylic.*				
Santonin. (Anhydrid of santoninic acid.)				
Vermifuge, for round-worms particularly	½ gr.	1 gr.	1–2 gr.	2 gr.
Senna.				
Cathartic. Best given as compound licorice powder, of which it is an ingredient (*q. v.*).				
Serum Antidiphtheriticum. (Diphtheria antitoxin.)				
For immunization:				
1000 to 2000 units.				

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Serum Antidiphtheriticum (*Continued*)				
In faucial diphtheria:				
3000 to 5000 units and repeat in eight hours if required.				
In laryngeal diphtheria:				
5000 units and repeat in eight hours if required.				
The repetition of the doses of antitoxin is discontinued only when the case ceases to require the serum.				
The dosage is independent of the age of the patient.				
Sodium.				
Sodium benzoate.				
Antiseptic, antipyretic, and antirheumatic.				
Used in cystitis with alkaline fermentation to acidify the urine, which it does by the liberation of hippuric acid	1 gr.	1–2 gr.	2 gr.	3 gr.
Sodium bicarbonate.				
Antacid, antirheumatic	1–2 gr.	2 gr.	3 gr.	5 gr.
Sodium borate. (Borax.)				
Antiseptic and astringent.				
Used as a gargle and mouth-wash in angina and stomatitis—1 dr. to 8 oz. of water.				
Sodium bromid. See under *Bromin.*				
Sodium iodid.				
Uses and doses the same as those of potassium iodid (*q. v.*).				
Sodium phosphate.				
Laxative and cholagogue	5–10 gr.	10–15 gr.	15–20 gr.	20–30 gr.
Sodium sulphate. (Glauber's salt.)				
Cathartic.				
Used in intestinal infection of inactive type	15–30 gr.	30–45 gr.	40 gr.–1 dr.	1 dr.
Sodium salicylate. See under *Acid, Salicylic.*				
Spearmint. (Mentha viridis.)				
Water of spearmint. (Aqua menthæ viridis—0.2 per cent. oil of spearmint.)				
Carminative, sedative, corrective, and vehicle	1 dr.	2 dr.	3 dr.	4 dr.
Strontium.				
Strontium bromid. See under *Bromin.*				
Strophanthus.				
Tincture of strophanthus (11 per cent. in New Pharmacopeia, or twice former strength).				
Cardiac tonic and diuretic. Preferred to digitalis in the treatment of children because better borne	1 drop	1–2 drops	2 drops	2–3 drops
Strychnin. See under *Nux Vomica.*				
Sugar. (Cane-sugar or saccharose.)				
Sweetening agent. May be substituted for lactose in the adaptation of cow's milk for infant-feeding.				
1 level tablespoonful equals ½ oz.				

Drug.	Dose.			
	6 Months.	18 Months.	3 Years.	5 Years.
Sugar of Milk. (Lactose.) Used as an excipient and in the adaptation of cow's milk for infant-feeding. 1 level tablespoonful equals ⅓ oz.				
Sulphonal. Not advised in the treatment of children.				
Sulphur. *Precipitated sulphur*, or milk of sulphur. Laxative and alterative. Given usually in syrups or other heavy vehicles	5 gr.	5–10 gr.	15–30 gr.	1 dr.
Used also as a reducing agent in bismuth mixtures when the stools do not become dark colored	1 gr.	1 gr.	1 gr.	1 gr.
Tannalbin. See under *Acid, Tannic.*				
Tannigen. See under *Acid, Tannic.*				
Tartar Emetic. See under *Acid, Tartaric.*				
Tartaric Acid. See *Acid, Tartaric.*				
Terebene. Stimulating expectorant and antiseptic	..	1 drop	1–2 drops	2 drops
Terpin Hydrate. Expectorant and antiseptic. Used in subacute and chronic bronchitis	..	..	¼ gr.	½ gr.
Trional. Not advised in the treatment of children.				
Urotropin. (Trade name for hexamethylenamin.) Urinary antiseptic and sedative	½ gr.	1 gr.	1–2 gr.	2–5 gr.
Whisky. See under *Alcohol.*				
Wild Cherry. *Syrup of wild cherry.* (Syrupus pruni virginiani.) Bronchial sedative and vehicle. Contains hydrocyanic acid	..	..	½ dr.	1 dr.

DRUGS FOR EXTERNAL USE

Acid, Boric.
Antiseptic of mild grade. 4 % is a saturated solution.
Used both in solution and in ointments.
In the form of scales it is most soluble and most convenient.

Acid, Carbolic. See *Phenol.*

Acid, Chromic. (Chromic Trioxid.)
A very strong caustic and astringent, used as a substitute for Nitrate of Silver.

Acid, Nitric (68 % pure acid).
Used as a caustic.

Acid, Salicylic.
Used in lotions or in ointments, 1% to 3%, for skin affections.

Acid, Tannic.
Astringent.
Used in 1% solution in dysentery; as an ingredient of suppositories for hemorrhoids. See also *Glycerite of Tannin* under *Glycerin.*

ADRENALIN. (Trade name for the active principle of the Adrenal Gland.)

Used in a solution in the strength of 1 part to 1000 of normal saline solution or sterilized oil.

Local hemostatic and astringent. It will render bloodless the field of operation of the eye, nose, and throat, but its use is often followed by hemorrhage.

ALUMINIUM ACETATE, Solution of.

Antiseptic dressing for cellulitis, abscesses, etc.

1. ℞ Aluminii sulphatis ..... ʒ 3½
   Acidi acetici ..... ʒ 4½
   Aquæ ..... ʒ 10

2. ℞ Calcii carbonatis ..... ʒ 1½
   Aquæ ..... ʒ 2½

Add 1 to 2, stirring.

AMYLUM. See *Starch.*

ARGENTUM. See *Silver.*

ARGYROL. See *Silver.*

ARISTOL. (Thymol Di-iodid.)

Mild antiseptic, used as a dusting-powder or in ointments.

BALSAM OF PERU.

A stimulating dressing for wounds and ulcers.

In Castor Oil, one part of the Balsam to six of the oil. It makes a useful application for burns and wounds.

BENZOIN.

Compound Tincture of Benzoin.

Used as a bronchial sedative in steam inhalations, one-half ounce to two pints of water.

BICHLORID OF MERCURY. See under *Mercury.*

BISMUTH SUBGALLATE. (Dermatol.)

Used externally as a drying antiseptic powder, either pure or in combination. Also as an ingredient of ointments of 10% to 20% strength.

BORACIC ACID. See *Acid, Boric.*

CACAO-BUTTER. (Oleum Theobromatis.)

A fixed oil expressed from the seeds of the *Theobroma Cacao.* Melts at 30°–35° C. (86°–95° F.).

Used as an emollient and as a base for suppositories. It may be used for nutrient inunctions, but it is less effective than Goose Oil.

CALAMINE. (Zinc Carbonate.)

Used as an ingredient of soothing lotions in itching affections of the skin—eczema, urticaria, dermatitis venenata, etc.

CALOMEL. See under *Mercury.*

CANTHARIDES.

Vesicant. Used best in the form of Collodion of Cantharides, *q. v.*

CARRON OIL. (Linimentum Calcis.)

Consists of equal parts of Lime-water and Linseed Oil.

Used as a soothing application for burns and scalds.

CHLOROFORM.

Locally a rubefacient and, when confined, a vesicant as well. A useful ingredient of liniments.

By inhalation, a general anesthetic.

CHRYSAROBIN.

Used in 5% ointment for psoriasis and tinea tonsurans.

COCAIN.

Alkaloid obtained from several varieties of *Coca.*

A local anesthetic when applied to wounds or mucous surfaces or when injected hypodermically.

For local application, 3% to 10% solutions.

For hypodermic use, 0.2% to 4% solutions.

COD-LIVER OIL.

May be used locally as a nutrient inunction, but its odor is objectionable.

COLLODION.

Solution of Pyroxylin in Alcohol and Ether.

Collodion of Cantharides (60% Cantharides). An excellent blistering agent.

Collodion of Ichthyol (10%–20%). Used to cover the wound after aspirations or lumbar punctures, and in checking the spread of erysipelas.

Collodion of Iodoform (5%). Used in erysipelas.
Collodion of Oil of Cade (1%–5%). Used in eczema.
Collodion of Salicylic Acid (10%). Used in removing corns and calluses.

CREOSOTE.
Used in inhalations as a pulmonary antiseptic.

DERMATOL. See *Bismuth Subgallate.*

EUCAIN.
Beta-eucain. Local anesthetic with action and uses similar to those of Cocain, but without its toxicity. Solutions can be sterilized without injury by boiling.

FORMALDEHYD.
Antiseptic and deodorant.
Used in solutions of from 0.5% to 2% strength, as an antiseptic.
Used in the form of the gas for disinfecting, the gas being generated by heat, from solutions, or from the solid, Paraform.

GLYCERIN.
Used chiefly as a solvent or excipient. Very hygroscopic. It is the base of the Glycerites.
Glycerite of Carbolic Acid—20% phenol in glycerin. An external antiseptic and antipruritic.
Glycerite of Starch—10%. A vehicle for skin preparations and for pills.

GOOSE OIL.
The oil tried from the goose. An excellent oil for nutrient inunctions. It is better than Olive Oil or Cacao-butter, for, being an animal oil, it is more readily absorbed by the skin. It is semifluid, has a low melting-point, and does not become hard after having been rubbed in.

GRINDELIA ROBUSTA.
The fluidextract, in the strength of one dram to a pint of water, is used as a wet dressing in dermatitis venenata.

GUAIACOL.
Combined with equal parts of Glycerin, it is used in acute joint affections, for its analgesic effect.

HAMAMELIS. See *Witch-hazel.*

HYDRARGYRUM. See *Mercury.*

HYDROGEN PEROXID.
Antiseptic and deodorizer. Used in 10-volume, 3% solution to clean wounds, and to dissolve and destroy pus.

ICHTHYOL.
Used in 1% solution in intertrigo.
Used in 5% to 50% solutions in skin diseases or in erysipelas.
Used in 5% to 50% ointments in skin diseases or in erysipelas.
Used suspended in oil in strength of 5% to 25% as a nasal spray.

IODIN.
Tincture of Iodin (7%).
Antiseptic and counterirritant.
Used particularly in tinea tonsurans and tinea circinata.

IODOFORM. Formyl Tri-iodid.
Antiseptic and alterative.
Used in the form of a powder, an ointment, or on gauze in the strength of 5% to 10%.

KAOLIN.
Cataplasma Kaolini.
A smooth, homogeneous mass, consisting of Kaolin, Boric Acid, Thymol, Methyl Salicylate, Oil of Peppermint, and Glycerin.

LANOLIN.
Used as an ointment base.

LEAD AND OPIUM WASH.
Anodyne lotion.

℞. Liquoris plumbi subacetatis ..... ℥iv
Tincturæ opii ..... ℥j
Aquæ ..... ℥xvj
Fiat mistura.
Sig.—Use externally.

MENTHOL. (Peppermint Camphor.)
Sedative, analgesic, refrigerant, and antipruritic.
Used in ointments, 1% to 5%.
Used in oily solutions, 1% to 5%.
Used triturated with equal parts of Camphor as an anodyne.

MERCURY.
Bichlorid of mercury.
Antiseptic. Used in 1 : 1000 to 1 : 20,000 solutions.
Calomel.
A milder antiseptic than the foregoing. Used as a dusting-powder in eye affections and in the lesions of secondary syphilis.
Mercury and ammonium chlorid. (White precipitate.)
Used in ointments of 1% to 10% strength as an antiparasitic and antisyphilitic. Of particular value in impetigo contagiosa, ringworm, etc.
Yellow oxid of mercury.
Antiseptic. Used in ointments of 0.5% to 10% strength in ophthalmia. Of value also in ringworm and syphilitic eruptions.

MUSTARD.
Counterirritant.
In the form of papers (*chartæ*) for local pain or vomiting.
In the form of powder:
In pastes of a strength of 1 part of mustard to from 2 to 6 parts of flour.
In baths—1 tablespoonful to 6 gallons of water.
In packs, in the same proportion.

OIL OF CADE. (Oil of Juniper Tar.)
Used as an antiparasitic in skin diseases.
In powders, 1% to 5% in a base of stearate of zinc.
In ointments, 1% to 5%.
In collodion, 1% to 5%.

OIL OF TURPENTINE. (Spirits of turpentine.)
Rubefacient and counterirritant.
Used as an ingredient of liniments.
Used in the form of turpentine stupes for the relief of abdominal distention. Flannel cloths are wrung out in hot water to each pint of which 10–20 drops of oil of turpentine have been added, and are then applied to the abdomen.

OLIVE OIL.
Used externally as a nutrient inunction.

PETROLATUM (Petroleum Jelly or "Vaselin").
Used as a base for ointments.

PHENOL. (Pharmacopeial name of Carbolic Acid.)
Local anesthetic and antiseptic.
Used as an antiseptic in solutions of the strength of 5% or less.
Used as a caustic and local anesthetic in strength of 95%.
Children are very susceptible to phenol poisoning.

PIX LIQUIDA. See *Tar*.

POTASSIUM PERMANGANATE.
Antiseptic and disinfectant.
Used in solutions in the strength of 1 : 4000 to 1 : 2000 on mucous surfaces, and in the strength of 1 : 1000 on ulcers and superficial wounds.

RESORCIN.
Antiseptic in skin diseases, particularly in seborrheic eczema.
Lotions, 1% to 5%.
Ointments, 1% to 5%.

SILVER.
Silver Nitrate. Antiseptic and astringent. Used in solutions of 1% to 50% strength. As a caustic, it is used in the solid form.
Argyrol. (Silver Vitellin—Proprietary.)
A mild antiseptic, not approaching the nitrate in efficacy. Used in solutions of 5% to 50% strength or in ointments of 5% to 50% strength.

SODIUM BICARBONATE.
Used in saturated solution as an antipruritic and as an analgesic in skin diseases and burns.

STARCH.
Used as the base of drying-powders.

SULPHUR.
In 5% to 25% ointments as a parasiticide, particularly in scabies.

Tar. (Pix Liquida.)

Antiseptic. Used in skin diseases as the official ointment (50%) or in ointments with other ingredients.

Zinc Oxid.

Used as a 20% ointment in benzoinated lard, in skin diseases, such as eczema, needing a mild astringent.

Used in dusting-powders in the strength of 5% to 10%.

Official zinc ointment makes a good base for stronger antiseptics, such as tar and oil of cade.

INDEX

Abbe on removal of kidney sarcoma, 427
Abdominal breathing, 781
  tonsil, 252
  tuberculosis, 673
    treatment, 674
Abortive type of acute poliomyelitis, 518, 519
Abscess, ischiorectal, 261
    symptoms of, 261
    treatment of, 261
  of breast in newly born, 167
  of liver, 263
  of spleen, 262
  peritonsillar, 282
    symptoms of, 283
    treatment of, 283
  pulmonary, 356
  retropharyngeal, 277
    acute, 275. See also *Retropharyngeal abscess, acute.*
    spasmodic croup and, differentiation, 285
Absence, congenital, of bile-ducts, 166
  of esophagus, 183
Abt and Strouse on traumatic diabetes, 711
Acarus scabiei, 553
Accoucheur hand, 477
Achondroplasia, 701. See also *Chondrodystrophia.*
Acid, hydrochloric, effect of, on milk, 96
Acne, staphylococcus vaccines in, 767
Acute miliary tuberculosis, typhoid fever and, differentiation, 640
  yellow atrophy of liver, 263
Adami and Nicholls on rickets, 130
    on typhoid fever, 638
Adams position, 790
Adapted milk, 70
Adenitis, acute, 406
    cold compress in, 408
    diagnosis, differential, 407
    duration of, 407
    etiology of, 406
    pathology of, 406
    prophylaxis of, 408
    symptoms of, 406
    termination of, 407
    treatment of, 408
  axillary, 408
  cervical, 407
  effect of removal of tonsils and adenoids on, 298
Adenitis in influenza, 654
  in measles, 604
  in scarlet fever, 628
      treatment, 634
  inguinal, 408
  persistent simple, 409
      Bier hyperemia treatment, 409
      treatment, 409
  retropharyngeal, 274
    spasmodic croup and, differentiation, 285
    treatment of, 274
  streptococcus vaccines in, 768
  suppurative, treatment of, 408
  tuberculous, 410
    age incidence, 410
    conditions favoring development, 411
    prognosis of, 412
    symptoms of, 411
    treatment of, 410
    types of infection, 411
Adenocarcinoma of kidney, 426
Adenoid curets, 297
  face, 143, 292
  tissue in leukemia, 402
Adenoids, 290
  age incidence, 291
  and tonsils, radical removal, 296, 297
      removal, adhesions after, 298
        benefits from, 298
  as cause of chronic rhinitis, 269
    of cough, 272
  associated with enlarged tonsils, 294
  diagnosis, 293
  drop jaw in, 292
  etiology, 291
  face, 143, 292
  method of examination for, 293
  mouth-breathing in, 292
  necessity for operative interference in, 295
  operation for permanent relief, 295
    for temporary relief, 294
  pathology, 291
  rhinitis in, 292
  symptoms, 292
  treatment, 294
  without facial deformity, 292
Adenoma of brain, 485
  of kidney, 426
Adenosarcoma of kidney, 426
Adherent pericardium, 387
  pleura as cause of cough, 272

Adherent prepuce, 445
Agglutinins, 765
Agoraphobia, 481
Air, cold, in acute illness, 146
in lobar pneumonia, 324
for nursing mother, 25
fresh, for new-born infant, 19
for premature infants, 154
in delicate children, 138
in habitual loss of appetite, 89
in measles, 607
in whooping-cough, 600
Airing, indoor, 732
of nursery, 38
Albuminuria in scarlet fever, 628
Alcohol, 752, 753
in bronchopneumonia, 336, 337
in lobar pneumonia, 327
in scarlet fever, 634
in sepsis in new-born, 161
Alkalis in milk adaptation, 71
Alum in whooping-cough, 597
Amaurotic family idiocy, 489
cherry red spot in, 491
course, 491
diagnosis, 491
etiology, 490
pathology, 490
prognosis, 491
symptoms, 491
treatment, 492
Amberg in eosinophilia in amebic dysentery, 394
Ammonium salts, 752
Amphoric breathing, 303
Amyotrophic lateral sclerosis, 507, 508
Amyotrophy, 507
progressive, 507, 510
course of, 512
diagnosis of, 512
etiology of, 511
Landouzy-Déjérine type, 510
of Erb's juvenile type, 510
pathology of, 511
prognosis of, 512
scapulohumeral type, 510
symptoms of, 511
treatment of, 512
Anaphylaxis, 685
Anderson and Goldberger on measles, 602
Anemia, 397
brickmaker's, 246
miner's, 246
pernicious, 402
symptoms of, 403
prognosis of, 398
pseudoleukemic, of von Jaksch, 400
treatment, 401
symptoms of, 398
treatment of, 398
Anencephalus, 483
Anesthetics, 721
chloroform, 721, 722
ether, 721, 722
ethyl chlorid, 722
Anesthetics, nitrous oxid gas, 721, 722
Angina gangrenosa, 608, 609
in scarlet fever, 626
maligna, 609
membranous non-diphtheric, in scarlet fever, 628
Angioma of spleen, 262
Angioneurotic edema, 551
Angiosarcoma of brain, 485
Angle of mouth, ulcerations and fissures, 182
Animal broths in cholera infantum, 204
Ankylostoma duodenale, 249
Anorexia, hysteric, 461
Anson on children of London schools, 141
Antacids in milk adaptation, 71
Antibodies, 765
Antimeningitic serum, 542–546
Antipyretic drugs, 717
Antipyrin in whooping-cough, 598, 599
Antispasmodics in spasmodic croup, 288
Antitoxin syringe, 614
tetanus, in tetanus neonatorum, 169
treatment of diphtheria, 612
choice of antitoxin, 613
dosage, 613
late injections, 614
means of injection, 614
promptness, 613
site of injection, 614
urticaria after, 615
Anuria, 418
Anus and rectum, diseases of, 257
prolapse of, 257
treatment, 257
fissure of, 259
diet in, 259
drugs in, 260
local measures, 260
symptoms, 259
treatment, 259
inflammation of, 259
treatment, 259
Aortic disease, treatment, 386
regurgitation, murmurs in, 367
Aphthæ, 177
Aphthous stomatitis, 177
Appendicitis, 251
age incidence, 252
blood in, 393
chronic, 254
symptoms of, 254
treatment of, 255
diagnosis, 253
differential, 253
exploratory incision in, 253
interval operation in, 254
intussusception and, differentiation, 253
leukocytosis in, 253
localized muscle rigidity in, 252
periodic vomiting and, differentiation, 253
peritonitis and, differentiation, 254
pleurisy and, differentiation, 254
pneumonia and, differentiation, 254

Appendicitis, prognosis, 253
spastic right rectus in, 252
symptoms, 252
treatment, 254
Appendix, vermiform, anatomy of, 251
Appetite, habitual loss of, 88
treatment, 88
in pyloric stenosis, 194
Archanzelsky on tuberculous meningitis, 536
Aretæus on diphtheria, 608
Arnold steam atomizer, 600
sterilizer, 108
Arthritis deformans, 700
diagnosis of, 728
gonorrheal, diagnosis of, 728
in scarlet fever, 629
treatment, 636
rheumatoid, 700
treatment of, 701
Articular rheumatism, acute, 697. See also *Rheumatic fever.*
Artificial feeding, 48
successful, 49
heat for premature infants, 153
respiration in asphyxia neonatorum, 163, 164
Ascaris lumbricoides, 246
symptoms, 247
treatment, 247
Aschoff on Hodgkin's disease, 405
Asclepiades on diphtheria, 608
Asphyxia as cause of convulsions, 470
livida, 162
treatment, 165
neonatorum, 161
artificial respiration in, 163, 164
delayed, 165
etiology of, 165
prognosis of, 165
symptoms of, 165
treatment of, 165
Dew's method of artificial respiration in, 164
diagnosis, 163
etiology, 161
Laborde's method of artificial respiration in, 164
mouth-to-mouth method of artificial respiration in, 163
pathology, 162
prognosis, 163
prophylaxis, 163
Schultze's method of artificial respiration in, 164
symptoms, 162
treatment, 163
pallida, 162
Aspiration in secondary pleurisy, 347
Asthma, bronchial, 312. See also *Bronchitis, acute spasmodic.*
climate in, 744
eosinophilia in, 394
Asthmatic breathing, 303
bronchitis, 312. See also *Bronchitis, acute spasmodic.*
Asthmatic chest, 299
Astraphobia, 481
Ataxia, Friedreich's, 528. See also *Friedreich's ataxia.*
hereditary, 528. See also *Friedreich's ataxia.*
cerebellar, exercises for, 797–809
spinal, exercises for, 797–809
Atelectasis, 165
treatment, 166
Ateleosis, 709
Athetosis in cerebral paralysis, 499
Athrepsia, 81. See also *Marasmus.*
Atomizer, Arnold steam, 600
Atresia hymenalis, 455
of urethra, 455
treatment, 455
of vagina, 455
treatment, 455
Atrophy, acute yellow, of liver, 263
infantile, 81. See also *Marasmus.*
muscular, progressive, 507
spinal, 507. See also *Muscular atrophy, progressive spinal.*
Atropin in enuresis, 422
Attendants in acute illness, 146
Aura of epilepsy, 513
Auscultation, 300
in acute endocarditis, 380
in bronchopneumonia, 330
in diseases of heart, 363
in emphysema, 343
in interstitial pneumonia, 339
in lobar pneumonia, 323
in pneumothorax, 342
in secondary pleurisy, 346
Austin on icterus, 157
Axillary adenitis, 408

Babcock-milk test, 57
Babinski's reflex in cerebrospinal meningitis, 540
in tuberculous meningitis, 534
Baby, blue, 375
scales, 42
Bacillus coli communis in cystitis and pyelitis, 769
in stool in phthisis, 359
influenzæ, 650
mode of entrance, 651
of diphtheria, 609
persistent nasal infection with, 618
of tetanus, 168
of whooping-cough, 593
pseudodiphtheria, in treatment of otitis media, 769
tubercle, 670
avenues of entrance, 671
typhosus, 637
dead, inoculations of, 768
Backward children, 486
Bacteria as etiologic factor in hemorrhagic diseases of newly born, 171
harmful, in cow's milk, 50

Bacteria, harmless, in cow's milk, 50
Bactericidins, 765
Balanitis, 445
  treatment of, 446
Barley jelly, formula for making, 104
Barley-water, dextrinized, formula for making, 105
  formula for making, 104
Barlow on scurvy, 124
Barrel-shaped chest, 343
Basch on effect of extirpation of thymus, 415
  on percussion of thymus, 414, 415
Basin-bath, 748
  for fever, 749
Baskets for early exercises, 45
Bassett and Duval on acute ileocolitis, 219
Bath, 748
  basin-, 748
    for fever, 749
  bran, 750
  brine, 750
  compressed-air, in emphysema, 797
  for comfort in hot weather, 750
  hot, 750
  in acute diffuse nephritis, 434
  in bronchopneumonia, 337
  in eczema, 570
    in older children, 575
  in measles, 606
  in recurrent bronchitis, 312
  in rheumatism, 689
  in summer, 733
  in tetany, 480
  in typhoid fever, 641
  mustard, 750
    in bronchitis, 309
    in bronchopneumonia, 335
  starch, 750
  thermometer, 749
  tub-, 748
    for fever, 749
    in scarlet fever, 633
Bathing of delicate children, 137
  of new-born infant, 20
  sick, 751
Bauchwitz on blood-pressure, 396
Beach on cretinism, 705
Bed-sores, 577
  treatment of, 577
Beef foods, proprietary, 107
  scraped, formula for making, 104
Beef-broth, formula for preparing, 103
Beef-juice, formula for preparing, 103
  in scurvy, 127
Beef-worm, 249
Behring on diphtheria, 609
Belladonna in enuresis, 422
  in whooping-cough, 598
Belt, Kilmer, in whooping-cough, 600
Bernhardt on scarlet fever, 624
Bernheim on pyloric stenosis, 193
Bezold on scarlatinal otitis, 635
Bichlorid of mercury, 752
Biedert on pertussis, 595
Bier hyperemia treatment of persistent adenitis, 409
Bile-ducts, congenital absence of, 166
Birch-Hirschfeld on icterus, 157
Birth-mark, 577. See also *Nævus*.
Bismuth subnitrate in acute ileocolitis, 223
Blackader on intestinal cysts, 246
Bladder, diseases of, 443
  eversion of, 444
  exstrophy of, 444
    treatment, 445
  stone in, 444
Blood, 389
  coagulation time, 397
  diseases, 389
  in appendicitis, 393
  in cerebrospinal meningitis, 392
  in congenital heart disease, 396
    syphilis, 394
  in diphtheria, 395
  in diseases, 392
  in empyema, 392
  in gastro-enteritis, 394
  in infections by intestinal parasites, 246
  in infectious diseases, 394
  in influenza, 392
  in measles, 395
  in meningitis, 393
  in newly born, 389
    specific gravity, 389
  in peritonitis, 393
  in pneumonia, 392
  in poliomyelitis, 393
  in rheumatism, 393
  in scarlet fever, 395
  in tuberculosis, 393
  in typhoid fever, 393
  in urine, 424
  in whooping-cough, 394
  vomiting of, 189
Blood-pressure in children, 396
Blood-vessels in tardy hereditary syphilis, 666
Blue baby, 375
Blumenreich on percussion of thymus, 414
Boas on excretion of urea, 436
Boils, 554
  treatment of, 554
Bones, changes in, in rachitis, 129, 130
  diseases of, diagnosis in, 727
  in tardy hereditary syphilis, 666, 667
Bordet and Gengou's bacillus, 593
Bothriocephalus latus, 249
Bottle, night, 65
  nursing-, 47
    care of, 47, 48
    nipple for, 47
      care of, 48
Bouchut on icterus, 157
Bovaird and Nicoll on weight of thymus, 414
Bovine tuberculosis, 670

Bovine tuberculosis, human tuberculosis and, Detrè's method of differentiation, 680
Bowditch on average weight of newborn infant, 41
Bowel feeding in acute illness, 148
function in acute illness, 148
in nursing mother, 24
Bowels, care of, in acute diffuse nephritis, 434
in epilepsy, 514
evacuation of, defective, 235
necessity for, 235
in bronchopneumonia, 334
in cerebrospinal meningitis, 539
in lobar pneumonia, 325
in scarlet fever, 632
Bowles' stethoscope, 305, 306
Brace to prevent masturbation, 467
Bradford on excretion of urea, 436
Brain, adenoma of, 485
angiosarcoma of, 485
carcinoma of, 485
cholesteatoma of, 485
cysts of, 485
fibroma of, 485
glioma of, 485
gliosarcoma of, 485
gumma of, 485
lobes of, malformations, 483
malformations of, 482
sarcoma of, 485
sepsis of, in new-born, 160
tuberculous tumors of, 485
tumors of, 485
wet-, in cholera infantum, 200
Bran bath, 750
Breast, abscess of, in newly born, 167
caking of, 36
treatment, 37
care of, during weaning, 30
inflammation of, in newly born, 167
in young girls, 413
of mother, 35
pigeon-, 299
in rachitis, 130, 131
Breast-feeding, substitute, 48
successful, 49
Breast-milk, 31
examination of, 32
Holt's method of examining, 32, 33
percentage composition of, 58
proteids of, 32, 33
sugar of, 33
Breast-pump, 36
Breath in cyclic vomiting, 693
Breathing, 780. See *Respiration.*
abdominal, 781
deep, in emphysema, 796
exercises, 782
for older children, 783
for younger children, 783
thoracic, 781
Breck feeder in premature infants, 155
Bretonneau on diphtheria, 609
Brickmaker's anemia, 246
Brine bath, 750
Bromids in epilepsy, 515
in whooping-cough, 598, 599
Bromoform in whooping-cough, 597
Bronchial asthma, 312. See also *Bronchitis, acute spasmodic.*
breathing, 303
distant, 302
Bronchiectasis, 340
treatment of, 341
Bronchitis, 306
acute spasmodic, 312
cases due to direct irritation, 314
etiology of, 313
interval treatment, 315, 316
mustard plaster in, 315
stimulant inhalations in, 315
treatment of, 315
asthmatic, 312. See also *Bronchitis, acute spasmodic.*
bacteriology of, 306
capillary, 313, 329
chronic, 307
bronchitis and, differentiation, 308
diagnosis, differential, 311
pulmonary tuberculosis and, differentiation, 311
treatment of, 311
counterirritants in, 745
counterirritation in, 309
diagnosis of, 307
diet in, 308
drugs in, 310
duration of, 307
etiology of, 306
fever in, 307
in influenza, 654
in measles, treatment, 606
mustard bath in, 309
plaster in, 309
palpation in, 307
pathology of, 307
percussion in, 307
physical signs, 307
primary, 306
recurrent, 311
bathing in, 312
dependent upon rheumatic state, 690
diet in, 312
drugs in, 312
treatment of, 312
secondary, 306
bronchitis and, differentiation, 308
simple, 306
steam inhalations in, 308
symptoms of, 307
treatment of, 308
types of, 306
Bronchopneumonia, 328
active types, 331
age incidence, 329
alcohol in, 336, 337
as cause of convulsions, 470
auscultation in, 330
baths in, 337

Bronchopneumonia, bowels in, 334
complications of, 332
counterirritants in, 334, 745
diagnosis, differential, 332
diet in, 334
drugs in, 335
duration of, 331
etiology of, 328, 329
fever in, treatment, 337
following other diseases, 332
heart stimulants in, 336
hypodermic medication in, 337
in influenza, 654
in measles, 604
in scarlet fever, 628
mustard baths in, 335
oxygen in, 338
palpation in, 330
pathology of, 329
percussion in, 330
physical signs, 330
prognosis of, 333
pyrexia in, treatment, 337
sick-room in, 333
special types, 331
steam inhalations in, 334
strophanthus in, 336
strychnin in, 336
symptoms of, 330
treatment of, 333
Bronchovesicular breathing, 303
Brophy's operation for cleft-palate, 182
Broth, animal, in cholera infantum, 204
beef, formula for preparing, 103
chicken, formula for making, 103
mutton, formula for making, 103
Brown on tuberculin skin reactions in infancy, 681
Brown and Holt on technic of salvarsan treatment of syphilis, 663, 664
Bruck on Wassermann test for syphilis, 682
Buhl and von Hecker on hemorrhagic disease of newly born, 170, 171
Buhl's disease, 170
Bulan on siphon drainage in empyema, 352
Bulan's method of siphon drainage in empyema, 352
Bulbar paralysis, progressive, 508, 510
spinal group of acute poliomyelitis, 518
Butter on pertussis, 593
Butyric-acid test, Noguchi, for syphilis, 683
Buxton on measles, 602

Cabot on bronchial breathing, 303
on leukocytosis in tuberculous peritonitis, 393
on pseudoleukemic anemia of von Jaksch, 400
on respiratory characteristics, 302
Caking of breasts, 36
treatment, 37
Calcium metabolism, tetany and, relation, 476
Calculus, vesical, 444
Calmette's tuberculin test for tuberculosis, 681
Calomel fumigations in spasmodic croup, 288
Calorimetric standard, 75
Cancrum oris, 180
symptoms, 180
treatment, 181
Cannon on action of pylorus, 185
Capacity of stomach, 184
Capillary bronchitis, 313, 329
Caput succedaneum, cephalhematoma and, differentiation, 156
Carbon incapacity as cause of eczema, 566
Carcinoma, 722
of brain, 485
of kidney, 427
of spleen, 262
Cardiorespiratory murmur, 368
Caries, tuberculous, of cervical vertebræ, 277
Carpenter and Gittings on coagulation of blood, 397
Carr on tuberculosis, 673
Carriers, tuberculosis, 671
typhoid, 638
Carstanjen on blood in new-born, 389
on transitional cells, 390
Carswell on ichthyol in pemphigus neonatorum, 560
Casein, 50, 71, 96
Castor oil, 752
Catarrh, nasal, 268
Catarrhal ileocolitis, 220
jaundice, 264
laryngitis, acute, 284. See also *Croup, spasmodic.*
pneumonia, 328. See also *Bronchopneumonia.*
proctitis, 260
stomatitis, 177
Catheter feeding in pyloric stenosis, 197
Catrin and Laveran on diplococcus of mumps, 590
Cautley on cerebral palsy, 496
on hemoglobin reduction in pseudoleukemic anemia of von Jaksch, 400
on Hirschsprung's disease, 229
on polycythemia in congenital heart disease, 396
Cavernous breathing, 303
Cecil on diabetes mellitus, 711
Cells, mast, 390
transitional, 390
Centrifugal cream, 108
Cephalhematoma, 155
caput succedaneum and, differentiation, 156
depressed fracture of skull and, differentiation, 156
diagnosis, differential, 156
double, 156

Cephalhematoma, encephalocele and, differentiation, 156
hydrocephalus and, differentiation, 156
pathology, 156
symptoms, 156
treatment, 156
varieties, 156
Céphalogie épidémique, 536
Cereal decoctions in cholera infantum, 204
gruels, 76
beginning feeding of, 76
in feeding dispensary patients, 69
in gastro-enteric diseases, 76
in milk adaptation, 72
percentages of, 104
Cerebellar ataxia, hereditary, exercises for, 797–809
Cerebral malformations, 482
palsies, 495. See also *Paralysis, cerebral.*
type of acute poliomyelitis, 518, 519
Cerebrospinal fluid in acute poliomyelitis, 517
in cerebrospinal meningitis, 537
in meningitis, 546
withdrawal of, in tuberculous meningitis, 536
meningitis, 536
age incidence, 538
Babinski's reflex in, 540
blood in, 393
bowels in, 539
cerebrospinal fluid in, 537
complications, 541
convulsions in, 539
deafness in, 539
diagnosis, 540
diet in, 546
duration, 541
ears in, 539
emaciation in, 541
etiology, 537
eye changes in, 539, 541
Flexner's serum in, 542–546
fontanel in, 539
fulminating cases, symptoms, 538
headache in, 539
heart action in, 539, 541
Kernig's sign in, 540
mental apathy in, 539
muscle rigidity in, 539
patellar reflex in, 540
pathology, 537
position of patient, 539
prognosis, 541
respiration in, 539, 541
skin in, 539
symptoms, 538
in fulminating cases, 538
in recovery cases, 539
tache cérébrale in, 540
temperature in, 539, 541
transmission, 537
treatment, 542
vaccine therapy, 769
Certified milk, 54
requirements of New York County Medical Society Milk Commission for production of, 55
Cervical adenitis, 407
lymph-nodes, tuberculosis of, 410. See also *Adenitis, tuberculous.*
vertebræ, tuberculous caries of, 277
Chaillon on diphtheria, 609
Chapin dipper, 60
Charcot-Marie-Tooth type of progressive spinal muscular atrophy, 508
Charcot's disease, 507
Cheadle on scurvy, 124
Chemical agents as etiologic factor in hemorrhagic diseases of newly born, 172
Cherry red spot in amaurotic family idiocy, 491
Chest, asthmatic, 299
auscultation of, 300
barrel-shaped, 343
contracted, 299
depressed, 299
distended, 299
dulness of, 300
exercises for, 783
fixed, 299
flatness of, 300
funnel, 299
in rachitis, 131
inspection of, 299
palpation of, 300
percussion of, 300
rachitic, 299
resonance of, 300
tympanitic dulness, 300
Chicken broth, formula for making, 103
Chicken-pox, 588. See also *Varicella.*
Chine-cough, 593
Chink cough, 593
Chlorate of potash in stomatitis, 179
dangers, 180
in tonsillitis, 282
Chloroform as anesthetic, 721, 722
in convulsions, 471
Chlorosis, 399
Egyptian, 246
prognosis of, 399
symptoms of, 399
treatment of, 399
Choking, 290
Cholera infantum, 199
acute, 198
animal broths in, 204
broths in, 204
cereal decoctions in, 204
condensed milk in, 204
diet in, 203
drugs in, 202
Eiweiss Milch in, 205
evaporated milk in, 204
feedings after first year, 205
hypodermoclysis of salt solution in, 203

Cholera infantum, milk substitutes in, 200
pathology, 200
proteid milk in, 205
salt solution in, 203
skimmed milk in, 203
symptoms, 199
termination, 201
treatment, 200
types, 198
urine in, 200
wet-brain in, 200
wet-nurse in, 204
Cholesteatoma of brain, 485
Chondritis, fetal, 701
Chondrodystrophia, 701
diagnosis of, 703
etiology of, 701
fœtalis malacia, 702
hyperplastic type, 702
hypoplastic type, 701
pathology of, 701
prognosis of, 703
symptoms of, 702
treatment of, 703
Chondromalacia, 701
Chorea, 500
anglorum, 500
antirheumatic treatment, 503
chronic adult, 500
progressive, 500
congenital, 500
diagnosis of, 502
drugs in, 504
duration of, 503
electric, 500
entertainment in, 503
etiology of, 500
Fowler's solution in, 504
gravidarum, 500
habit, 502
spasm and, differentiation, 502
Huntington's, 500
major, 500
minor, 500
pathology of, 501
posthemiplegic, 500
prognosis of, 502
recurrence of, 502
rest treatment, 503
rheumatism and, relation, 501
school in, 503
senile, 500
symptoms of, 501
treatment of, 503
supplementary, 505
vulgaris, 500
Choreic insanity, 500
Churchill on Diplococcus pneumoniæ, 317
on splenomyelogenous leukemia, 401
Chvostek's sign in tetany, 477
Circumcision, 447
Cirrhosis of liver, 263
symptoms, 263
treatment, 264
Clark on pyloric stenosis, 193
Clark and Flexner on acute poliomyelitis, 517, 518
Claw-hand in progressive amyotrophy of hand type, 508
Cleft-palate, 182
Brophy's operation for, 182
etiology, 182
symptoms, 182
treatment, 182
varieties, 182
Climate, 743
change of, in habitual loss of appetite, 89
in influenza, 657
in asthma, 744
in care of delicate children, 139
in digestive disorders, 743
in influenza, 747
in malnutrition, 743
in nephritis, 744
in phthisis, 360
in pneumonia, 743
in tetany, 480
in tuberculosis, 744
in whooping-cough, 743
influence of, in acute ileocolitis, 225
Clothing during exercise, 771
in acute illness, 146
in eczema, 570
in lobar pneumonia, 324
in posture, 775
in scarlet fever, 631
in summer, 733
of delicate children, 140
Clubbed fingers in congenital heart disease, 376
Club-foot, 484
Coagulation time of blood, 397
Cocain in whooping-cough, 597
Codein in whooping-cough, 599
Coit on milk commission, 54
Cold air in acute illness, 146
in lobar pneumonia, 324
as therapeutic agent, 755
compress in acute adenitis, 408
in spasmodic croup, 287
in tonsillitis, 282
douche, 749
in head, 266
pack in fever of bronchopneumonia, 338
sponging in fever, 746
Colic, 212
counterirritants in, 746
diagnosis of, 213
diet in, 213
enema in, 213
hot applications in, 214
medication in, 214
treatment of, 213
Colitis, mucous, 228
diet in, 229
drugs in, 229
symptoms of, 228
treatment of, 228

Colon flushing, 763
idiopathic dilatation of, 229
irrigation, 761
in acute enteric intoxication, 207
ileocolitis, 224
in chronic ileocolitis, 227
Colonic feeding, 121
Colony management in epilepsy, 515
Colostrum, 31
Comby on blood-pressure, 397
on hemoglobin reduction in pseudo-leukemic anemia of von Jaksch, 400
Complement fixation test for syphilis, 683
Compress, cold, in acute adenitis, 408
in spasmodic croup, 287
in tonsillitis, 282
Compressed-air bath in emphysema, 797
Concepts, imperative, 481
Condensed milk, analysis of, 114
in cholera infantum, 204
in difficult feeding, 114
in marasmus, 87
in out-patient work, 68, 69
Condyloma in acute hereditary syphilis, 660
Congenitally weak infants, 153
Congestion in lobar pneumonia, 318
Consanguinity, 715
Consciousness in new-born infant, 44
Constipation, 234
after acute ileocolitis, treatment, 226
exercises for, 811, 812
in bottle-fed, 237
drugs in, 238
enema in, 238
laxative agents in food in, 238
local measures in, 238
oil injections in, 238
proteid as cause, 237
suppositories in, 238
treatment, 238
in chronic ileocolitis, treatment, 227
in malnutrition in older children, treatment, 94
in nursing mother, treatment, 24
in nurslings, 235
drugs in, 236
enemas in, 237
malted foods in, 237
suppositories in, 237
treatment of child, 236
of mother, 236
in older children, 239
diet in, 239
after fifth year, 241
after second year, 240
drugs in, 241
enema in, 241
etiology, 239
regular habits in, 239
suppositories in, 241
in pyloric stenosis, 194
obstinate, diet in, 242
oil injections in, 242
treatment of, 242
Contagious diseases, 587
care by physician in visiting, 588
Contracted chest, 299
Convulsions, 468
asphyxia as cause, 470
bronchopneumonia as cause, 470
chloroform in, 471
dentition, 470, 471
as cause, 175
diet in, 471
enlargement of thymus gland as cause, 469
enterocolitis as cause, 470
etiology of, 469
gastro-intestinal causes, 469
heredity as cause, 470
hypodermic medication in, 472
in acute diffuse nephritis, 431
in cerebrospinal meningitis, 539
inward, 470
manifestations of, 470
of toxic origin, 469
phimosis as cause, 470
prognosis of, 470
rachitis as cause, 469
rectal medication in, 471
repetition, 470
sedatives in, 471, 472
treatment of, 471
uremic, 470
Cooke and Hamilton on gonococcus injections in vulvovaginitis, 768
Cool pack, 747
Cord, umbilical, care of stump, 43
Coryza, 266
Cough, 271
adenoids as cause, 272
adherent pleura as cause, 272
chink-, 593
habit, 271
in influenza, 652
in measles, 603
treatment, 606
king's, 593
nervous, 271, 272
persistent, 271
pertussis as cause, 273
pulmonary tuberculosis as cause, 273
stomach, 271, 272
teething, 271, 272
tracheal, 273
types of, 271
Cow's milk, 49. See also *Milk, cow's.*
Cracked nipple, 35
treatment of, 36
Craig on malaria, 647
on Wassermann test for syphilis, 683
Craniectomy in microcephalus, 483
Craniotabes in rachitis, 130, 131
Cream, 107
centrifugal, 108
gravity, 60, 107
mixtures in marasmus, 86
Creosote, 752
Cretinism, 704
acquired, 706

Cretinism, diagnosis of, 706
etiology of, 704
pathology of, 705
prognosis of, 707
rachitis and, differentiation, 132
symptoms of, 706
thyroid treatment, 707–709
treatment of, 707
Cretinoid idiocy, 704. See also *Cretinism.*
Crisis, delayed, in lobar pneumonia, 321
Crocker on tinea tonsurans, 558
Croup kettle, 309
Holt's, 287
spasmodic, 284
antispasmodics in, 288
calomel fumigations in, 288
cold compress in, 287
diagnosis, differential, 285
etiology of, 284
expectorants in, 286
laryngismus stridulus and, differentiation, 285
pathology of, 284
retropharyngeal abscess and, differentiation, 285
adenitis and, differentiation, 285
steam inhalations in, 288
symptoms of, 285
treatment of, 285
Crust, milk, 575
Cruveilhier on ulcers in stomach in melena, 171
Crying, 46
causes of, 46
varieties of, 46
Curets, adenoid, 297
Curling on cretinism, 705
Curvature, lateral, of spine, 788. See also *Scoliosis.*
Cutaneous inoculation with tuberculin in diagnosis of tuberculosis, 679
sensibility in new-born infant, 44
Cyclic diarrhea, 695
symptoms, 695
treatment, 696
vomiting, 691
appendicitis and, differentiation, 253
breath in, 693
diagnosis, differential, 693
drugs in, 694
etiology, 692
prognosis, 693
symptoms, 692
treatment, 694
in interval, 694
of acute attack, 694
Cyclops, 483
Cystitis, 440, 443
Bacillus coli communis in, 769
diagnosis of, 443
etiology of, 443
symptoms of, 443
treatment of, 444
Cysts, intestinal, 245
of brain, 485
Cysts of kidney, 428
symptoms, 429
treatment, 429
of spleen, 262
Czerny on tetany, 476

Dachez, Draper, and Peabody on poliomyelitis, 393, 518, 520, 521
Dactylitis, 678
pathology of, 678
syphilitica, 678
treatment of, 679
tuberculosa, 678
dactylitis syphilitica and, differentiation, 678
Dana on porencephalus, 483
on progressive amyotrophy, 507
Dancing mania, 500
Danielson and Mann on cerebrospinal meningitis, 536
Davis on influenza, 651
on pertussis, 594
Days to go out-of-doors, 732
Day-terrors, 456
Deafness, 579
in cerebrospinal meningitis, 539
in tardy hereditary syphilis, 665
Decubitus, 577
treatment of, 577
Defective bowel evacuation, 235
Deformities in rachitis, treatment, 134
Degeneration, fatty, of liver, 263
Delicate child, 134
bathing, 137
care of, 135–141
climate in care of, 139
clothing of, 140
education, 140
effect of removal of tonsils and adenoids on, 298
entertainment, 140
exercise, 140
feeding, 136, 137
fresh air, 138
midday nap, 140
nursery, 139
sleeping rooms, 139
weighing, 136
Delirium in lobar pneumonia, 321
Dementia præcox, 481
Deming's milk modifier, 66, 67
Dent on pyloric stenosis, 193
Dentition, 175
as cause of digestive disorders, 175
convulsions, 175, 470, 471
disturbances of, 175
Denys and Leclef on phagocytosis, 765
Depressed chest, 299
nipples, 36
Desquamation in German measles, 608
in scarlet fever, 626
Detrè's method of differentiation of human from bovine tuberculosis, 680
Development, abnormal, of child, 135
normal, of child, 134

Deviation test for syphilis, 683
Dew's method of artificial respiration in asphyxia neonatorum, 164
Diabetes, experimental, 711
insipidus, 710
diagnosis, 710
etiology, 710
symptoms, 710
treatment, 710
mellitus, 711
diagnosis, 712
diet in, 713
duration, 713
morbid anatomy, 711
pathogenesis, 711
prognosis, 713
symptoms, 712
treatment, 713
urine in, 712
Diagnosis, 142
by inspection, 142
Diagnostic methods, newer, 679
Diaphoresis as means of relieving fever, 717
Diaphragmatic hernia, 727
Diarrhea, cyclic, 695
symptoms of, 695
treatment of, 696
due to too strong food, 65
in lobar pneumonia, 321
in typhoid fever, treatment, 644
summer, instructions in, 737
Diesophagus, 183
Diet after first year, 97
after sixth year, 100
during illness, 100
reduction in food strength in, 100
from first to sixth year, 96
in acute diffuse nephritis, 433
endocarditis, 381
gastric indigestion, 186
ileocolitis, 225
illness, 146
simple meningitis, 532
in bronchitis, 308
in bronchopneumonia, 334
in cerebrospinal meningitis, 546
in cholera infantum, 203
in chronic ileocolitis, 227
in colic, 213
in constipation in older children, 239
after fifth year, 241
after second year, 240
in convulsions, 471
in diabetes mellitus, 713
in epilepsy, 514
in fissure of anus, 259
in habitual loss of appetite, 89
in icterus, 264
in laryngismus stridulus, 474
in lobar pneumonia, 325
in malnutrition, 91
in mucous colitis, 229
in obesity, 722
in obstinate constipation, 242
in phthisis, 360
Diet in pyloric stenosis, 197
in rachitis, 132, 133
in recurrent bronchitis, 312
in rheumatism, 688
in scarlet fever, 631
in scurvy, 127
in second summer, 96
in typhoid fever, 641
milk, in scarlet fever, 632
of nursing mother, 24
proteid, in tetany, 480
schedule for feeding, after first year, 97–100
Dietetic glycosuria, 425
Difficult feeding, 112
condensed milk, 114
cow's milk, 115
evaporated milk, 114, 115
malt-soup, 113
milk, 113
plain milk, 115
whey, 113
Digestion in stomach, 184
duration, 185
starch, in young infants, 77
Digestive disorders, climate in, 743
dentition as cause, 175
Digitalis, 753
in chronic valvular disease of heart, 387
in lobar pneumonia, 327
Dilatation, idiopathic, of colon, 229
of esophagus, congenital, 183
of stomach, chronic, 188
symptoms of, 188
treatment of, 188
in older children, 189
vomiting in, 218
Diphtheria, 608
age incidence, 609
antitoxin treatment, 612
choice of antitoxin, 613
dosage, 613
late injections, 614
means of injection, 614
promptness, 613
site of injection, 614
urticaria after, 615
bacillus of, 609
persistent nasal infection with, 618
bacteriology of, 609
blood in, 395
complications of, 612
diagnosis of, 611
differential, 611
heart stimulants in, 616
history of, 608
immunization in, 615
in scarlet fever, 628
incubation period, 610
intubation in, 619
displacement of membrane, 623
indications, 620
necessity for, 623
position, 622
removal of tube, 623

Diphtheria, intubation in, results, 622
technic, 621
laryngeal, 616
treatment of, 617
localization of membrane, 611
multiple neuritis after, 522
treatment, 525
nasal, 617
acute rhinitis and, differentiation, 266
treatment of, 618
nourishment in, 616
pathology of, 610
predisposition to, 609
prognosis of, 612
quarantine in, 615
sick-room régime, 616
symptoms of, 610
temperature in, 611
tonsillar, tonsillitis and, differentiation, 280
tonsillitis and, differentiation, 611
transmission of, 609
treatment of, 612
Diplegia, 498
Diplococcus intracellularis of Weichselbaum, 536, 537
pneumoniæ, 317
Directions, written, in acute illness, 150, 151
Dispensary patients, feeding of, 67
Distended chest, 299
Diverticulum, intestinal, congenital, 245
Döhle on scarlet fever, 395, 624
Dosage, drug, 815
of diphtheria antitoxin, 613
Double empyema, 355
Douglas and Wright on opsonins, 765
Drainage in empyema, 351
siphon, in empyema, 352
Draper and Peabody on acute poliomyelitis, 393, 517, 518, 520, 521
Draper, Flexner, and Peabody on acute poliomyelitis, 516
Dried-milk foods, proprietary, 106
Drinking water in acute illness, 146
Dromomania, 481
Drop jaw in adenoids, 292
Dropsy of kidney, 428
Drugs, 815–831
antipyretic, 717
dosage of, 815
for external use, 827–831
for internal use, 815–827
nauseating, 751
promiscuous use, by family, 769
unpalatable, 751
use of, in acute illness, 148
Dry pleurisy, 345
Dubini's disease, 500
Duchenne-Aran's disease, 507, 508
Duke on Buhl's disease, 172
Dulness, 300
of chest, 300
tympanitic, of chest, 300
Dunn on Flexner's serum in cerebrospinal meningitis, 543, 544
Duval and Bassett on acute ileocolitis, 219
Dwarfism, 709
Dwarfs, 709
Dysarthria due to intestinal toxemia, 211
Dysentery, 219. See also *Ileocolitis, acute.*
Dystrophy, muscular, primary, 510. See also *Amyotrophy, progressive.*

Ear changes in tardy hereditary syphilis, 665
diseases of, 579
syringe, 581, 583
syringing, 584
Earache, 579
Ears in cerebrospinal meningitis, 539
in measles, care of, 605
Eczema, 565
age incidence, 566
bathing in, 570
carbon incapacity as cause, 566
clothing in, 570
eosinophilia in, 394
etiology of, 565
in older children, 572
bathing in, 575
etiology, 573
prognosis, 574
symptoms, 573
treatment, 574
local, 575
intertrigo, 570
Herty mask in, 571
location, 570
prognosis, 570
strait-jacket in, 571
treatment, 570
local irritation as factor, 566
neurotic, 574
physical condition in, 566
prognosis of, 567
reflex, 574
symptoms of, 566
toxic origin, 565
traumatic, treatment of, 570
treatment of, 567
in bottle-fed, 568
in breast-fed, 557
local, 569
Edema, angioneurotic, 551
Edgar on treatment of asphyxia neonatorum, 164
Edsall on urine in cyclic vomiting, 693
Education of delicate children, 140
of mother, 741
Effusion, pleuritic, lobar pneumonia and, differentiation, 323
Eggs, idiosyncrasy to, 118, 119
whites of, as nutrient enema, 123
Egg-water, formula for making, 104
Egyptian chlorosis, 246
Ehrlich on splenomyelogenous leukemia, 401
Eiselsberg on thyroid grafting in cretinism, 704

Eisenberg on icterus, 157
Eiweiss Milch, 74
in cholera infantum, 205
Electric chorea, 500
irritability in tetany, 478
reactions in acute poliomyelitis, 520
in cerebral paralysis, 499
in multiple neuritis, 524
Electrotherm in premature infants, 153, 154
Elimination as means of relieving fever, 717
Elliot on seborrhœa intertrigo, 576
Emaciation in cerebrospinal meningitis, 541
Embolism, 496
Emerson on blood findings in diphtheria, in meningitis, 393
on chondrodystrophia, 701
on hemoglobin reduction in pseudoleukemic anemia of von Jaksch, 400
on leukocytes in whooping-cough, 394
on leukocytosis in pseudoleukemic anemia of von Jaksch, 400
in scarlet fever, 395
on polymorphonuclear neutrophiles, 390
on splenomyelogenous leukemia, 401
Emphysema, 343
auscultation in, 343
compressed-air bath in, 797
deep breathing in, 796
development of accessory muscles of expiration in, 797
exercises for, 795
Gerhardt's exercise in, 796
McKenzie's exercise in, 796
of mediastinum, 343
pathology of, 343
percussion in, 343
prognosis of, 343
rarefied air apparatus in, 797
respiratory exercises in, 796
Satterthwaite's method of artificial respiration in, 796
subcutaneous, 343
Sylvester's method of artificial respiration in, 796
symptoms of, 343
treatment of, 343
Emphysematous breathing, 303
Empyema, 347
after lobar pneumonia, 349
age incidence, 347
bacteriology of, 347
blood in, 392
counterirritants in, 746
deformity following untreated cases, 352
diagnosis of, 350
differential, 350
double, 355
drainage in, 351
siphon, 352
encysted, as cause of elevation of temperature, 720
Empyema, etiology of, 347
exercises for, 793, 794
in lobar pneumonia, 322
Naunyn's exercise for, 793
necessitatis, 356
pathology of, 348
pleurisy and, differentiation, 350
pneumococcus vaccines in, 769
pneumonia and, differentiation, 351
pulmonary tuberculosis and, differentiation, 351
siphon drainage in, 352
staphylococcus vaccines in, 767
Sylvester's method of artificial respiration in, 793
symptoms of, 348
treatment of, 351
by siphon drainage, 352
Encephalitis, 496
Encephalocele, 482
cephalhematoma and, differentiation, 156
Encysted empyema as cause of elevation of temperature, 720
hydrocele of cord, 450
Endocarditis, acute, 378
age incidence, 378
antirheumatic treatment, 382
auscultation in, 380
bacteriology of, 378
convalescence in, 383
diagnosis of, 380
differential, 381
diet in, 381
drugs in, 382
etiology of, 378
ice-bag in, 382
inspection in, 380
palpation in, 380
pathology of, 379
percussion in, 380
prognosis of, 381
prolonged inactivity in, 381
recurrence of, 383
rest in bed in, 381
symptoms of, 379
treatment of, 381
in scarlet fever, 628
malignant, 379
prognosis of, 381
Enema in colic, 213
in constipation in bottle-fed, 238
in nurslings, 237
in older children, 241
nutrient, 121
amount of nourishment, 123
in acute illness, 148
method of giving, 121
nourishment not to be used, 122
to be used, 123
peptonized milk for, 80
Engel on myelocytes in diphtheria, 395
on pyloric stenosis, 193
Enlargement of heart in congenital heart disease, 376
of spleen, 262

Enlargement of thymus gland as cause of convulsions, 469
of tonsils, adenoids associated with, 294
chronic, 294
pseudomuscular, 510
Enteric intoxication, acute, 205
irrigation of colon in, 207
pathology, 206
stimulants in, 207
treatment, 206
Enterocolitis as cause of convulsions, 470
Entertainment for delicate children, 140
in chorea, 503
Enuresis, 419
abstinence from fluids in, 422
atropin in, 422
belladonna in, 422
diagnosis of, 421
diurna, 419
etiology of, 420
nocturna, 419
drugs in, 422
management, 422
of nervous origin, 420
prognosis of, 421
treatment of, 421
Environment, 714
as factor in artificial feeding, 49
in nutrition and growth of new-born infant, 17
Eosinophiles, 390
Eosinophilia, 394
in asthma, 394
in eczema, 394
in parasitic infections, 246, 394
Eosinophilic myelocytes, 390
Epidemic parotitis, 590. See also *Mumps*.
Epilepsy, 512
aura of, 513
bromids in, 515
care of bowels in, 514
colony management in, 515
diagnosis of, 513, 514
diet in, 514
drugs in, 515
grand mal, 513
in cerebral paralysis, 497, 499
petit mal, 513
prognosis of, 514
treatment of, 514
types of, 513
Epiphysitis, acute, in acute hereditary syphilis, 661
Epispadias, 450
Epstein on icterus, 157
Erb on primary muscular dystrophy, 511
Erb's juvenile type of progressive muscular atrophy, 510
paralysis, 526
diagnosis, 527
lesions, 527
prognosis, 527
treatment, 527
Ermold's lamp, 288
Errors in feeding, 102
Erysipelas, 562
complications of, 563
convalescence in, 565
etiology of, 562
ichthyol in, 564
prognosis of, 563
streptococcus vaccines in, 768
symptoms of, 562
treatment of, 563, 564
vaccine, 565
Erythema intertrigo, 570. See also *Eczema intertrigo*.
multiforme, 562
treatment, 562
nodosum, 561
etiology, 561
symptoms, 561
treatment, 561
Erythrocytes, 389
in newly born, 389
Escherich on tetany, 475, 478
Esophagotracheal fistula, 183
Esophagus, absence of, 183
dilatation of, congenital, 183
diseases of, 176
malformation of, 183
stenosis of, congenital, 183
Ether as anesthetic, 721, 722
Ethyl chlorid as anesthetic, 722
Evacuation of bowels, defective, 235
necessity for, 235
Evaporated milk in cholera infantum, 204
in difficult feeding, 114, 115
Eversion of bladder, 444
Ewing on blood findings in diphtheria, 395
on leukocytosis in pneumonia, 392
on pathology of bronchopneumonia, 329
Examination, 142
first, 144
of lungs, 299
of throat, 270
Exercise, 771
accuracy of, 772
active, in nervous children, as cause of elevation of temperature, 718
adaptation of, to practical ends, 774
and air for maternal nursing, 25
basket, 45
breathing, 782
for older children, 783
for younger children, 783
care of general health in, 773
clothing during, 771
concentration in, 773
conditions under which, should be taken, 771
coöperation in, 774
double mirrors during, 772
duration of, 772
for anterior poliomyelitis, 809
for arms in anterior poliomyelitis, 810
for constipation, 811, 812

Exercise for delicate child, 140
for emphysema, 795
for empyema, 793, 794
for flat chest, 783
for flat-foot, 812–814
for Friedreich's ataxia, 798, 809
for hereditary cerebellar ataxia, 797–809
spinal ataxia, 797–809
for kyphosis, 785
for round shoulders, 785
for scoliosis, 790
for speech in congenital ataxias, 808
for upper limbs in congenital ataxias, 808
forms of, 772
frequency of, 772
Gerhardt's, in emphysema, 796
in bad posture, 777
in interstitial pneumonia, 341
in obesity, 723
ladder, in congenital ataxias, 805
McKenzie's, in emphysema, 796
modification of, 773
Naunyn's, for empyema, 793
overwork in, 773
pen, 737
prescription of, 772
respiratory, in emphysema, 796
rest in, 773
rules for, 771
shot-bag, for bad posture, 779
static, for bad posture, 779
temperature of room in, 771
temporary discontinuance, 773
Exhaustion, gavage in, 761
Exomphalos, 723
Experimental diabetes, 711
Expiration, 301, 302
Exploratory incision in appendicitis, 253
puncture in secondary pleurisy, 346
Expression, facial, as aid in diagnosis, 143
Exstrophy of bladder, 444
treatment, 445
Eye changes in cerebrospinal meningitis, 539, 541
in tardy hereditary syphilis, 665, 668
in measles, 603
care of, 605
inoculation with tuberculin in diagnosis of tuberculosis, 680

Face, adenoid, 143, 292
Facial expression as aid in diagnosis, 143
paralysis, 526
treatment, 526
Fagge on cretinism, 704, 705
Falling sickness, 512
Family history, 145
Fat of cow's milk, modification of, 59,
Fatty degeneration of liver, 263
Faucial tonsils, 278
Faucitis, 273
Faucitis, treatment of, 273
Fears, morbid, 481
Feces, incontinence of, 230
treatment, 231
Feeble-minded children, 486
Feeding after first year, 94, 97
after sixth year, 100
artificial, 48
substitute, 49
bowel, in acute illness, 148
breast-, substitute, 48
successful, 49
by inunction, 120
of oil, 120
by means of oil inunctions, 120
calorimetric standard, 75
catheter, in pyloric stenosis, 197
colonic, 121
difficult, 112
condensed milk in, 114
cow's milk in, 115
evaporated milk in, 114, 115
malt-soup in, 113
milk in, 113
plain milk in, 115
whey in, 113
Eiweiss Milch, 74
errors in, 102
forced, 758
hypodermic, 120
in delicate children, 136, 137
in hot weather, changes in, 69
in illness, 100
art of, 101
reduction in food strength in, 100
in marasmus, 86
in second summer, 96
in stomatitis, 179
inunction, 120
malt-soup, 73
mixed, 29
night, 65
of new-born infant, 18
of premature infants, 154
rectal, 121
amount of nourishment, 123
in acute illness, 148
nourishment not to be used, 122
to be used, 123
scientific, 111
starch, 76
stomach-, substitutes for, 119
substitute, Chapin dipper for, 60
condensed milk and, 68, 69
for dispensary patients, 67
full milk, 68
laboratory methods, 66
modifying milk, 57
number of feedings, 61–64
top-milk, 63
whey-, 72
Feeling in new-born infant, 44
Feer on pyloric stenosis, 193
Ferments, pancreatic, in young infants, 79
Fetal chondritis, 701

Fetal rickets, 701
Fever, 716
as an indication, 716
basin-bath for, 749
cold sponging in, 746
control of, in scarlet fever, 633
cool pack in, 747
in acute diffuse nephritis, 431
illness, 148
otitis, 581
retropharyngeal abscess, 277
in bronchitis, 307
in bronchopneumonia, treatment, 337
in lobar pneumonia, treatment, 325
methods of relieving, 717
periodic, as cause of elevation of temperature, 720
tub-bath for, 749
Fibrinous pleurisy, 345
pneumonia, 317. See also *Pneumonia, lobar.*
Fibroma of brain, 485
of kidney, 426
of spleen, 262
Fièvre cérébrale, 536
Finger-enucleation method of removing tonsils and adenoids, 296, 297
Fingers, clubbed, in congenital heart disease, 376
Finger-sucking, 463
Finger-tips, picking or rubbing, 464
Finkelstein on icterus, 157
on pyloric stenosis, 193
Finkelstein and Meyer's Eiweiss Milch, 74
First heart-sound, 363
Fischl on tetany, 475, 477
Fissure at angle of mouth, 182
in acute hereditary syphilis, 661
of anus, 259
diet in, 259
drugs in, 260
local measures, 260
symptoms, 259
treatment, 259
of lips, 181
treatment, 181
of nipple, 35
treatment, 36
Fistula, esophagotracheal, 183
Fixed chest, 299
Flat chest, 300
exercises for, 783
Flat-foot, exercises for, 812–814
massage in, 813
Fleischmann on capacity of stomach, 184
Flexner on acute ileocolitis, 220
on acute poliomyelitis, 516, 517
on serum treatment of cerebrospinal meningitis, 542, 543
Flexner's serum in cerebrospinal meningitis, 542–546
Flexner and Clark on acute poliomyelitis, 517, 518
Flexner and Jobling on cerebrospinal meningitis, 537
Flexner and Lewis on acute poliomyelitis, 517, 518
Flexner, Peabody, and Draper on acute poliomyelitis, 516
Flies, contamination of milk by, 53
Floor of nursery, 38
Flushing, colon, 763
Follicular tonsillitis, acute, 279
Fontanel in cerebrospinal meningitis, 539
Food, adaptation of, 95
advantage of knowledge of composition, 95
beef, proprietary, 107
elements, function of, 94
formulas, 103
general properties, 94
ingredients of, 94
malted, in constipation in nurslings, 237
proprietary, 76, 105
addition of fresh cow's milk to, 106
beef, 107
dried-milk foods, 106
reduction in strength, during illness, 100
selection of, 95
and preparation, for new-born infant, 19
strength, reduction of, in summer, 733
substances, idiosyncrasy to, 118
too strong, signs of, 65
too weak, signs of, 65
Foot, club-, 484
flat-, exercises for, 812–814
massage in, 813
Forced feeding, 758
Foreign bodies in larynx, 290
treatment, 290
in nose as cause of chronic rhinitis, 269
swallowed, 739
Formulæ, food, 103
for condensed milk mixtures, 69
for feeding dispensary patients, 68, 69
for making barley jelly, 104
barley-water, 104
beef broth, 103
beef-juice, 103
chicken broth, 103
dextrinized barley-water, 105
egg-water, 104
Imperial Granum water, 105
junket, 105
mutton broth, 103
oatmeal jelly, 104
oatmeal-water, 105
percentage gruel flours, 104
rice-water, 104
scraped beef, 104
wheat jelly, 104
whey, 105
for top-milk feeding, 63
Fossa, supratonsillar, 278
Fournier on tardy hereditary syphilis, 665
Fowler on blood in appendicitis, 393

Fowler's solution in chorea, 504
Fox on thyroid medication in myxedema, 704
Fracture, depressed, of skull, cephalhematoma and, differentiation, 156
Franck on icterus, 157
Freeman on rickets, 127
on urotropin in pyelitis, 443
on vaccine treatment of pertussis, 602
pasteurizer, 109
Fremitus, vocal, in lobar pneumonia, 323
Fresh air for new-born infant, 19
for premature infants, 154
in delicate children, 138
in habitual loss of appetite, 89
in measles, 607
in whooping-cough, 600
Freund on pyloric stenosis, 192, 193
Friedleben on weight of thymus, 414
Friedreich's ataxia, 528
diagnosis, differential, 529
exercises for, 798, 809
pathology, 528
prognosis, 529
symptoms, 528
treatment, 529
Fröhlich and Muenier on leukocytosis in pertussis, 395
Fumigations, calomel, in spasmodic croup, 288
Funicular hydrocele, 449
Funnel chest, 299
in rachitis, 131
Furniture of nursery, 38
Furstenburg on Buhl's disease, 171
Furunculosis, 554
staphylococcus vaccines in, 767
treatment of, 554
vaccine, 555

Gait, waddling, in pseudomuscular hypertrophy, 511
Galen on diphtheria, 608
Ganghofner on tetany, 475
Gangrene, pulmonary, 356
Gant on intestinal cysts, 246
Gardner on syrup of hypophosphites in interstitial pneumonia, 341
Gastric digestion, 184
duration, 185
indigestion, acute, 185
diet in, 186
persistent vomiting in, 185
treatment, 187
protracted cases, treatment, 186
treatment of, 186
chronic, 187
pathology of, 187
symptoms of, 187
treatment of, 187
Gastritis, acute, 185
chronic, 187
Gastro-enteric diseases, cereal gruels in, 76
Gastro-enteric intoxication, 199. See also *Cholera infantum.*
Gastro-enteritis, blood in, 394
Gastro-intestinal causes of convulsions, 469
Gavage, 758
in exhaustion, 761
in lobar pneumonia, 327
in malnutrition, 761
in multiple neuritis after diphtheria, 525
in narcosis, 761
in obstinate vomiting, 759
in severe illness, 760
peptonized milk for, 80
Gengou and Bordet on bacillus of pertussis, 593
Genitals, female, 451
male, 445
Geographic tongue, 181
Gerhardt's exercise in emphysema, 796
German measles, 607
complications, 608
desquamation in, 608
diagnosis, 608
differential, 608
etiology, 607
incubation period, 607
lymphatic gland enlargement in, 607
prognosis, 608
rash in, 607
scarlet fever and, differentiation, 608
symptoms, 607
treatment, 608
Getzowa on cretinism, 705
Giant hives, 551
Gilford on dwarfism, 709
Gittings and Carpenter on coagulation time of blood, 397
Glands, tuberculous, 410. See also *Adenitis, tuberculous.*
Glandular fever, 410
symptoms, 410
treatment, 410
involvement, general, 406
system, 406
Glioma of brain, 485
Gliosarcoma of brain, 485
Glisson on rickets, 127
on scurvy, 124
Globus hystericus, 460
Glycosuria, 425
Gofflsey on tubercle bacilli in tuberculous adenitis, 411
Goldberger and Anderson on measles, 602
Gonococcus vaccines, 768
Gonorrhea in male, 450
treatment, 350
in nursery maids, 39
Gonorrheal arthritis, diagnosis, 728
vulvovaginitis, 452. See also *Vulvovaginitis, gonorrheal.*
Gowers on Friedreich's ataxia, 528
Graham on Buhl's disease, 172
Grand mal of epilepsy, 513

Granuloma, umbilical, in newly born, 169
treatment, 170
Granum-water, Imperial, formula for making, 105
Gravity cream, 60, 107
Gray hepatization in lobar pneumonia, 318
Greger on leukocytosis, 391
Grippe, 650. See also *Influenza.*
Grocery milk, 54
Grooves, Harrison's, in rachitis, 130
Growing pains, 687
Growth and nutrition of new-born infant, 17. See also *New-born infant, nutrition and growth.*
Gruel flours, percentage, formula for making, 104
Gruels. See *Cereal gruels.*
Gull on cretinism, 704
Gumma of brain, 485
Gymnastic therapeutics, 771. See also *Exercise.*
Gyrospasm, 458
etiology of, 458
prognosis of, 458
symptoms of, 458
treatment of, 458

Habit chorea, 502
cough, 271
spasm, 505
chorea and, differentiation, 502
treatment, 506
Habits, 463
bad, correction of, 463
Habitual loss of appetite, 88
treatment, 88
vomiting, lavage of stomach in, 191
management, 190
Hairy mole, 578
Hamburger's tuberculin test for tuberculosis, 679
Hamilton and Cooke on gonococcus injections in vulvovaginitis, 768
Hand, accoucheur, 477
claw-, in progressive amyotrophy of hand type, 508
Hand-I-Hold Mit, 468
Harelip, 182
etiology, 182
symptoms, 182
treatment, 182
varieties, 182
Harrison's grooves in rachitis, 130
Hay-fever, 314
Head, cold in, 266
lice, 556
treatment, 556
Headache, 456
in cerebrospinal meningitis, 539
treatment of, 456
Head-banging, 464
Head-rest to prevent bed-sores, 577
Hearing of new-born infant, 44

Heart action in cerebrospinal meningitis, 539, 541
chronic valvular disease, 383. See also *Valvular disease, chronic, of heart.*
disease, congenital, 375
blood in, 396
cardiac enlargement in, 376
classification of lesions, 376
clubbed fingers in, 376
diagnosis of, 377
differential, 377
murmur in, 377, 378
pathology of, 376
prognosis of, 375
symptoms of, 375
diseases of, 363
auscultation in, 363
diagnosis in, 361
inspection in, 364
palpation in, 365
percussion in, 365
thrill in, 367
enlargement of, in congenital heart disease, 376
involvement in scarlet fever, 636
murmurs, 365
diagnosis, differential, 368
functional, 365, 367
after acute illness, 368
differential diagnosis, 368
during development, 368
etiology of, 368
treatment of, 369
in aortic regurgitation, 367
in congenital heart disease, 377, 378
in mitral regurgitation, 366
stenosis, 366
inorganic, 365, 367
location of lesions by, 365, 366
non-valvular, 365, 367
organic, 365
regurgitant, 365
stenotic, 365
valvular, 365
venous, 367
rest in chronic valvular disease of heart, 386
sepsis of, in new-born, 160
sounds, first, 363
normal, 363
second, 363
stimulants, abuse of, 388
tuberculosis of, 359
Heat, artificial, for premature infants, 153
as therapeutic agent, 754
dry, 755
local application, in acute diffuse nephritis, 435
moist, 754
Heating of nursery, 38
Hecker on blood findings in measles, 395
Hecker and Buhl on hemorrhagic disease of newly born, 170, 171
Height, 43

Height, table of, 41
Heiman on icterus, 157
Hektoen on leukocytosis in measles, 395
Heliotherapy in tuberculosis, 677
Heller and Levin on tardy hereditary syphilis, 665
Hematemesis, 189
Hematoma of sternocleidomastoid, 723
Hematuria, 424
Hemicephalus, 483
Hemiplegia, 496, 498
Hemoglobin, 389
  percentage of, in newly born, 389
Hemoglobinuria, 424
  paroxysmal, 424
Hemorrhage from stomach, 189
  in acute hereditary syphilis, 661
  intestinal, in typhoid fever, 640
    treatment, 646
  meningeal, 496
  nasal, 270
    treatment of, 270
Hemorrhagic diseases of newly born, 170
    bacteria as etiologic factor, 171
    chemical agents as etiologic factor, 172
    heredity as etiologic factor, 171
    mechanical means as etiologic factor, 171
    metabolic changes as etiologic factor, 172
    serum treatment, 173
    syphilis as etiologic factor, 171
    treatment, 173
    Welch's treatment, 173
  purpura, 403
Henoch on mortality of typhoid fever, 641
Henoch's purpura, 403
Hepatization, gray, in lobar pneumonia, 318
  red, in lobar pneumonia, 318
Herb on mumps, 591
Hereditary ataxia, 528. See also *Friedreich's ataxia.*
  cerebellar ataxia, exercises for, 797–809
  spinal ataxia, exercises for, 797–809
Heredity and environment, 714
  as etiologic factor in hemorrhagic diseases of newly born, 171
  as factor in nutrition and growth of new-born infant, 17
  in cause of convulsions, 470
  in posture, 777
Hernia at umbilicus, 723
  diaphragmatic, 727
  inguinal, 725. See also *Inguinal hernia.*
  of umbilical cord, 724
    treatment, 724
  strangulated, causing intestinal obstruction, 245
  umbilical, congenital, 724
    treatment of, 724
  ventral, 727
Herringham on malignant tumors of kidney, 426
Herty mask in eczema, 571
Hess on icterus, 158
  on pancreatic ferments, 79
  on pyloric stenosis, 196, 197
Heubner on calorimetric principles in infant-feeding, 75
  on cerebrospinal meningitis, 536
  on starch digestion, 80
Hiccup, 468
Hip, tuberculous disease of, diagnosis, 729
Hirsch on amaurotic family idiocy, 490
Hirschfeld on rickets, 129
Hirschsprung on pyloric stenosis, 193
Hirschsprung's disease, 229
    etiology, 229
    prognosis, 230
    symptoms, 229
    treatment, 230
Hirt on chorea, 501
Hirth on spotted fever, 536
History record, 144
Hives, 551. See also *Urticaria.*
Hoarseness in acute hereditary syphilis, 659
Hochsinger on tardy hereditary syphilis, 665, 666
Hodgkin's disease, 405
    lymph-nodes in, 405
    spleen in, 405
    treatment, 405
Hoffmann on progressive amyotrophy, 507
Hoffmann and Schaudinn on Spirochæta pallida, 657
Hofmeier on icterus, 157
Hofmeister on icterus, 157
Holb on tetany, 476
Holberstein on icterus, 157
Holt on acute ileocolitis, 220
  on average weight of house-clothing, 41
    of new-born infant, 40
  on capacity of stomach, 184
  on electrotherm, 154
  on eosinophilia in asthma, 394
  on intussusception, 232
  on leukocytosis in measles, 395
    in scarlet fever, 395
  on pyloric stenosis, 192
  on scarlatinal otitis, 635
  on siphon treatment of empyema, 353
  on splenomyelogenous leukemia, 401
  on temperature in encysted empyema, 720
  on tetanus neonatorum, 169
  on tuberculous adenitis, 411
  on von Pirquet's tuberculin test, 681
Holt's croup kettle, 287
  method of examining breast-milk, 32, 33
  milk set, 33
Holt and Brown on technic of salvarsan treatment of syphilis, 663, 664
Home on diphtheria, 609
Home modification of milk, 66
Hoobler on blood-pressure, 396, 397

Hood frame truss, 726
Hook-worm, 249
disease, 249
symptoms, 250
treatment, 250
Hopping in congenital ataxias, 807
Horse-chestnut leaves, fluidextract of, in whooping-cough, 597
Horsley on cretinism, 704, 705
Hot applications in acute ileocolitis, 224
in colic, 214
bath, 750
weather bathing, 750
changes in feeding in, 69
Howitz on thyroid medication in cretinism, 704
Howland on blood-pressure, 396, 397
Human milk, 31. See also *Breast-milk.*
Hunger, thirst-, in new-born infant, 44
Huntington's chorea, 500
Hutchinson's teeth, 667
Hutinel on blood-pressure, 396, 397
Hydrencephalocele, 482
Hydrocele, 449
congenital, 449
funicular, 449
infantile, 449
inguinal hernia and, differentiation, 726
of cord, 449
encysted, 450
of tunica vaginalis, 450
treatment of, 450
varieties of, 449
Hydrocephalus, 484, 492
cephalhematoma and, differentiation, 156
chronic external, 492
internal, 493
congenital, 492
diagnosis, 495
duration, 494
external, 492
chronic, 492
internal, 492, 493
chronic, 493
prognosis, 494
rachitis and, differentiation, 132
symptoms, 493
treatment, 495
Hydrochloric acid, effect of, on milk, 96
Hydromyelocele, 484
Hydronephrosis, 427
as cause of intestinal obstruction, 245
etiology of, 427
pathology of, 428
prognosis of, 428
symptoms of, 428
treatment of, 428
Hydrotherapy as means of relieving fever, 717
in lobar pneumonia, 325
in typhoid fever, 646
Hygiene in malnutrition, 91
in rachitis, 133
Hyperemia treatment of persistent adenitis, 409
Hyperpyrexia, 716
highest, 716
importance of, 717
Hypertrophy. See *Enlargement.*
Hypodermic feeding, 120
medication in bronchopneumonia, 337
in convulsions, 472
stimulation in lobar pneumonia, 327
Hypodermoclysis of salt solution in cholera infantum, 203
Hypospadias, 450
Hypostatic pneumonia, 341
Hysteria, 458, 481
anorexia in, 461
convulsive cases, 460
diagnosis of, 461
drugs in, 463
duration of, 461
etiology of, 459
globus hystericus in, 460
imitation in, 459
mental activity in, 462
physical activity in, 462
sensory type, 461
symptoms of, 460
treatment of, 461
during hysteric seizure, 462
vomiting in, 461
Hysteric anorexia, 461
vomiting, 461

Ibrahim on pyloric stenosis, 492
Ice-bag in acute adenitis, 408
endocarditis, 382
Ichthyol in erysipelas, 564
in mastitis in newly born, 167
Icterus, 264
catarrhal, 264
diet in, 264
drugs in, 264
neonatorum, 156
symptoms, 158
theories relating to, 156
treatment, 158
obstructive, 264
symptoms, 264
treatment, 264
vomiting in, 264
Idiocy, 485
amaurotic family, 489. See also *Amaurotic family idiocy.*
cretinoid, 704. See also *Cretinism.*
Mongolian, 486. See also *Mongolian idiocy.*
Idiopathic dilatation of colon, 229
Idiosyncrasy to cow's milk, 117
to eggs, 118, 119
to food substances, 118
Idiot, microcephalic, 483
Ileocolitis, acute, 219
associated lesions, 221
bacteriology of, 219
bismuth subnitrate in, 223
colon irrigation in, 224
constipation after, treatment, 226

Ileocolitis, acute, diet in, 225
drugs in, 222
duration of, 222
hot applications in, 224
influence of climate in, 225
morphin in, 223
opium in, 223
pathology of, 220
serum treatment, 225
starch and opium in, 224
symptoms of, 221
tannalbin in, 223
treatment of, 222
catarrhal, 220
chronic, 226
constipation in, treatment, 227
diet in, 227
symptoms of, 226
treatment of, 227
pseudomembranous, 221
ulcerative, 220
Ileus, paralytic, treatment of, 206
Illness, acute, attendants, 146
bowel feedings, 148
function, 148
clothing, 146
cold air, 146
essentials in care of, 145
diet, 146
drinking of water, 146
drugs, 148
keeping in bed, 145
needless interference, 146
pyrexia, 148
room temperature, 146
sick-room, 146, 149
sponging, 146
stimulation, 149
suppression of urine, 148
urine examination, 147
ventilation, 146
written directions, 150
functional heart murmur after, 368
nutrient enema, 148
diet during, 100
reduction in food strength in, 100
Imbecility, 485
Imitation, 459
Immunity, 764
to acute poliomyelitis, 518
Immunization in diphtheria, 615
Imperative concepts, 481
Imperial Granum water, formula for making, 105
Impetigo contagiosa, 559
etiology, 559
symptoms, 560
treatment, 560
Incision, exploratory, in appendicitis, 253
Incontinence of feces, 230
treatment, 231
of urine, 419. See also *Enuresis.*
Incubators, baby, defective air-supply in, 153
Index, opsonic, 765
phagocytic, 766
Indigestion, gastric, acute, 185, 186
diet, in 186
persistent vomiting in, 185
treatment, 187
protracted cases, treatment, 186
treatment of, 186
chronic, 187
pathology of, 187
symptoms of, 187
treatment of, 187
intestinal, acute, 208. See also *Intestinal indigestion, acute.*
persistent, 210
in older children, 210
treatment, 212
treatment of, 210
Individual, treatment of, 152
Indoor airing, 732
Infant, new-born, 17. See also *New-born infant.*
Infantile atrophy, 81. See also *Marasmus.*
hydrocele, 449
myopathy of facioscapulohumeral type, 510
myxedema, 704. See also *Cretinism.*
paralysis, 516. See also *Poliomyelitis, acute.*
Infantilism, symptomatic, 709
Infection, nasal, persistent, with bacillus of diphtheria, 618
Infectious diseases, 587
blood in, 387
care by physician in visiting, 588
Inflammation of anus, 259
treatment, 259
of breast in newly born, 167
in young girls, 413
of rectum, 260. See also *Proctitis.*
Influenza, 650
acute rhinitis and, differentiation, 266
adenitis in, 654
age incidence, 651
bacillus of, 650
mode of entrance, 651
bacteriology of, 650
blood in, 392
bronchitis in, 654
bronchopneumonia in, 654
change of climate in, 657
climate in, 747
complications of, 654
cough in, 652
diagnosis of, 655
drugs in, 657
duration of, 655
etiology of, 650
gastro-intestinal manifestations, 653
incubation period, 651
kidneys in, 654
nephritis in, 654, 655
otitis in, 654
pathology of, 651
prognosis of, 655
quarantine in, 656
sequels of, 655

Influenza, source of infection, 651
symptoms of, 651
temperature in, 653
treatment of, 656
external, 657
vapor treatment, 656
Ingelev on scurvy, 124
Inguinal adenitis, 408
glands, enlarged, inguinal hernia and, differentiation, 726
hernia, 725
diagnosis, 726
differential, 726
enlarged inguinal glands and, differentiation, 726
etiology, 725
hydrocele and, differentiation, 726
prognosis, 726
treatment, 726
undescended testicle and, differentiation, 726
Inhalations of steam in bronchitis, 308
in bronchopneumonia, 334
in spasmodic croup, 288
in whooping-cough, 597, 600
Insanity, 480
choreic, 500
treatment of, 482
Inspection, diagnosis by, 142
during sleep, 144
in acute endocarditis, 380
in diseases of heart, 364
of lungs, 299
Inspiration, 301, 302
Institution treatment of mentally defective children, 488
Instructions for summer, 733
Intercostal neuralgia, counterirritants in, 746
Interstitial pneumonia, 338. See also *Pneumonia, interstitial.*
Intestinal cysts, 245
diseases, acute, of summer, etiology, 215
prevention, 214–218
diverticulum, congenital, 245
hemorrhage in typhoid fever, 640
treatment, 646
indigestion, acute, 208
duration of, 209
in bottle-fed, treatment, 209
in breast-fed, treatment, 209
prognosis of, 209
symptoms of, 209
treatment of, 209
persistent, 210
in older children, 210
treatment, 212
treatment of, 210
infection as cause of elevation of temperature, 720
with defective bowel action, treatment, 206
irrigation in acute ileocolitis, 224
in chronic ileocolitis, 227
obstruction, 244
peritonitis and, differentiation, 256
Intestinal parasites, 246
blood in infections by, 246
Intestines, diseases of, 184
invagination of, 231. See also *Intussusception.*
sepsis of, in new-born, 160
tuberculosis of, 359
Intoxication, enteric, acute, 205. See also *Enteric intoxication, acute.*
gastro-enteric, 199. See also *Cholera infantum.*
Intra-abdominal tumors as cause of intestinal obstruction, 245
Intubation in diphtheria, 619
displacement of membrane, 623
indications, 620
necessity for, 623
position, 621
removal of tube, 623
results, 622
technic, 621
set, O'Dwyer's, 619, 620
Intussusception, 231
age incidence, 232
appendicitis and, differentiation, 253
diagnosis, 232
etiology, 231
peritonitis and, differentiation, 256
presence of tumor, 232
prognosis, 233
reduction by water-pressure, 233
symptoms, 232
temperature in, 232
treatment, 233
types, 231
Inunction, feeding by, 120
Invagination of intestine, 231. See also *Intussusception.*
Iodid of potash, 752
Ipecac, 752
Iphophon on cretinism, 705
Iron, tincture of muriate, 753
Irrigation, colon, 761
in acute enteric intoxication, 207
ileocolitis, 224
in chronic ileocolitis, 227
of throat, 277
in tonsillitis, 281
indications, 277
technic, 278
Ischiorectal abscess, 261
symptoms, 261
treatment, 261
Itch, 553
treatment of, 553
Ivy poisoning, 552
treatment, 552

Jackson on treatment of nevus, 578
Jacobi on cerebrospinal meningitis, 536
on starch digestion, 80
on tuberculosis, 672
Jaksch on starch digestion, 78
pseudoleukemic anemia of, 400
Janeway on causes of hypotension, 397

Japha on leukocytosis, 391
Jaundice. See *Icterus*.
Javal on salt-free diet in nephritis, 433
Jaw, drop, in adenoids, 292
Jelly, barley, formula for making, 104
  oatmeal, formula for making, 104
  wheat, formula for making, 104
Jobling and Flexner on cerebrospinal meningitis, 537
Jochmann and Krause on pertussis, 594
Joint affections in tardy hereditary syphilis, 667
  diseases, diagnosis in, 727
  tuberculosis, diagnosis, 728
Joints, sepsis of, in new-born, 160
Jumping in congenital ataxias, 807
Junket, formula for making, 105
Jurgensen on scarlet fever, 623

Karnizki on transitional cells, 390
Karo on pyloric stenosis, 193
Kassowitz on tetany, 475
Kenyon's method of siphon drainage in empyema, 352
Kernig's sign in cerebrospinal meningitis, 540
  in tuberculous meningitis, 534
Kettle, croup, 309
Key-note position in scoliosis, 792
Kidney, adenocarcinoma of, 426
  adenoma of, 426
  adenosarcoma of, 426
  carcinoma of, 427
  cysts of, 428
    symptoms, 429
    treatment, 429
  diseases of, 426
  dropsy of, 428
  fibroma of, 426
  in influenza, 654
  new-growths of, 426
  of scarlet fever, 430
  rhabdomyosarcoma of, 427
  sarcoma of, 427
    as cause of intestinal obstruction, 245
  tuberculosis of, 359, 426
    treatment, 426
  tumors of, 426
    treatment, 427
Kilmer belt in whooping-cough, 600
Kimball on summer mortality, 215
Kindt on operation in hernia of umbilical cord, 724
King on bacteria in milk, 51
Kingdon and Jay on cherry red spot, 491
King's cough, 593
Kinkcough, 593
Kirchoff on insanity, 480
Kitasato on tetanus bacillus, 168
Klebs-Löffler bacillus, 609
  persistent nasal infection with, 618
Kleptomania, 481
Knee-crutch to prevent masturbation, 466
Knöpfelmacher on acute poliomyelitis, 517
  on Buhl's disease, 172
Kocher on cretinism, 705
Kolmer on inclusion bodies in streptococcus infections, 395, 396
  on scarlet fever, 624
Kolossowa on blood-pressure, 396
Koplik on anemia, 398
  on epilepsy, 512
  on leukocytosis in pneumonia, 392
  on localization of lobar pneumonia, 319
  on mortality of typhoid fever, 641
  on treatment of asphyxia neonatorum, 163
  of gonorrheal proctitis, 261
Koplik's spots in measles, 604
Korwin and Zweifel on pancreatic extract, 79
Krause and Jochmann on pertussis, 594
Kretschmar on scarlet fever, 624
Krumweide and Park on tuberculosis, 670, 671, 675
Kyphosis, exercises for, 785

La Fétra on adrenalin in bronchial asthma, 316
  on blood findings in poliomyelitis, 393
  on treatment of cholera infantum, 201
Laboratory feeding, 66
Laborde's method of artificial respiration in asphyxia neonatorum, 164
Lactalbumin of cow's milk, 50
Lactose of cow's milk, 50
Ladder exercises in congenital ataxias, 805
Lamar and Meltzer on Diplococcus pneumoniæ, 317
Lamb on calorimetric principles in infant-feeding, 75
Lambert on hemorrhage in new-born, 173
Lamp, Ermold's, 288
Landau on Buhl's disease, 171
Landouzy-Déjérine type of muscular atrophy, 510
Landsteiner on acute poliomyelitis, 517
  on scarlet fever, 624
Landsteiner and Papper on acute poliomyelitis, 517
Langer on sclerema, 158
Langhans on cretinism, 706
Langstein on persistent glycosuria, 711
Lannelongue on tardy hereditary syphilis, 666
Laryngeal diphtheria, 516
    treatment, 617
  obstruction, 290
Laryngismus stridulus, 472
    diagnosis, 473
    diet in, 474
    drugs in, 473
    duration, 473
    etiology, 472
    morbid anatomy, 472

Laryngismus stridulus, prognosis, 473
rectal medication in, 474
spasmodic croup and, differentiation, 285
symptoms of, 472
treatment, 473
Laryngitis, catarrhal, acute, 284. See also *Croup, spasmodic.*
traumatic, 289
treatment of, 289
Larynx, foreign bodies in, 290
treatment, 290
tuberculosis of, 360
Laughter of new-born infant, 45
Lavage, 756
in marasmus, 86
indications for, 757
of stomach in habitual vomiting, 191
technic of, 756
Laveran and Catrin on diplococcus of mumps, 590
Laxatives in scarlet fever, 632
Leaking nipples, 35
Leclef and Denys on phagocytosis, 765
Leiner and Wiesner on acute poliomyelitis, 517
Leishmania infantum, 262
Leukemia, 401
adenoid tissue in, 402
etiology of, 402
liver in, 402
lymphatic, 401
lymph-nodes in, 402
morbid anatomy, 402
prognosis of, 402
spleen in, 402
splenomyelogenous, 401
treatment of, 402
Leukemic infiltrates, 402
Leukocytes, 389
found in pathologic conditions, 390
in newly born, 389
Leukocytic cream, 765
Leukocytosis, 391
absolute, 391
in appendicitis, 253
in parasitic infections, 246
pathologic, 391
physiologic, 391
relative, 391
Levaditi on acute poliomyelitis, 517
on scarlet fever, 624
Levaditi and Netter on acute poliomyelitis, 518, 520
Levin and Heller on tardy hereditary syphilis, 665
Lewis and Flexner on acute poliomyelitis, 517, 518
Lice, head, 556
treatment of, 556
Limbeck on leukocytosis in tuberculosis, 393
Lingual tonsils, 279
Lips, fissures of, 181
treatment, 181
Liver, abscess of, 263
Liver, acute yellow atrophy of, 263
cirrhosis of, 263
symptoms, 263
treatment, 264
diseases of, 262
fatty degeneration of, 263
in acute hereditary syphilis, 659
in leukemia, 402
in tardy hereditary syphilis, 666, 668
tuberculosis of, 359
Lobar pneumonia, 317. See also *Pneumonia, lobar.*
Loraine on dwarfs, 709
Lucas on acute poliomyelitis, 517
Lucas and Prizner on measles, 603
Lucretius on epilepsy, 512
Luetin test, Noguchi, for syphilis, 684
Lumbar puncture, 547
in acute simple meningitis, 531
in diagnosis of tuberculous meningitis, 535
position of patient, 547
Quincke needle for, 547
technic, 547
uses, 548
Lungs, 299
abscess of, 356
acute pneumococcous infection of, 313
auscultation of, 300
consolidation of, in pneumonia, 322
defective expansion, 299
examination of, 299
gangrene of, 356
inspection of, 299
palpation of, 300
percussion of, 300
sepsis of, in new-born, 160
Lymphadenoma, 405
Lymphatic glands, diseases of, 406
enlargement in German measles, 607
leukemia, 401
Lymphatism, 406
Lymph-nodes, cervical tuberculosis of, 410. See also *Adenitis, tuberculous.*
in Hodgkin's disease, 405
in leukemia, 402
in tardy hereditary syphilis, 666, 668
Lymphocytes, 389
Lymphoma, 402
Lysins, 765

MacKenzie on thyroid medication in cretinism, 704
MacLeod on experimental diabetes, 711
Maid, nursery, 39
gonorrhea in, 39
physical examination, 39
schools for training, 39
Malaria, 646
diagnosis of, 648
differential, 649
pathology of, 647
physical examination, 648
prophylaxis of, 649
quinin in, 649

Malaria, recurrence of, 650
relapse in, 648
symptoms of, 648
transmission of, 647
treatment of, 649
Malformations of brain, 482
of esophagus, 183
of lobes of brain, 483
of spinal cord, 482
Malignant endocarditis, 379
prognosis, 381
Mallory on typhoid fever, 638
Malnutrition, 90
climate in, 743
diagnosis, 91
etiology, 90
gavage in, 761
in older children, 92
etiology, 92
treatment, 92
symptoms, 90
tardy, 92
of syphilitic origin, 669
treatment, 669, 670
treatment, 91
Malted foods in constipation in nurslings, 237
Maltose, 106
Malt-soup feeding, 73
in difficult feeding, 113
Mania, 481
dancing, 500
Manipulation of different parts of body, 464
Mann and Danielson on cerebrospinal meningitis, 536
Marasmus, 81
age occurring, 81
etiology, 82
history of case, 82
infection as cause, 82
pathology, 81
treatment, 83
where wet-nurse is impossible, 85
wet-nurse in, 83
Marriages, consanguineous, 715
Martin on diphtheria, 609
Mask, Herty, in eczema intertrigo, 571
Massage in anterior poliomyelitis, 811
in flat-foot, 813
in hernia of sternocleidomastoid, 723
Mast cells, 390
Mastitis, acute, 37
in new-born infant, 167
treatment, 167
in young girls, 413
suppurative, 37
Mastoiditis, 585
complications of, 585
symptoms of, 585
treatment of, 586
Masturbation, 465
brace to prevent, 467
knee-crutch to prevent, 466
prophylaxis of, 465
treatment of, 466
Maternal nursing, 21
air and exercise for mother in, 25
care of mother's bowels in, 24
nipples in, 31
conditions forbidding, 29
constipation in mother in, treatment, 24
diet of mother in, 24
exercise for mother in, 25
frequency, 26
insufficient signs of, 28
management of abnormal milk conditions, 28
menstruation in, 30
mixed feeding, 29
regularity in, 25
signs of insufficient, 26
of successful, 26
of unsuccessful, 26
substitute for, 48
successful signs of, 26
temporary discontinuance of, 31
unfavorable factors for, 30
weaning, 30
Mathews on operation for removal of tonsils and adenoids, 296
May on scarlatinal otitis, 636
McBurney's point, 251
McCallum on tetany, 477
McCosh on anatomy and physiology of appendix, 251
McKenzie's exercise in emphysema, 796
McKernon on argyrol in acute otitis, 584
Measles, 602
acute rhinitis and, differentiation, 266
adenitis in, 604
age incidence, 603
baths in, 606
blood in, 395
bowel function in, 605
bronchitis in, treatment, 606
bronchopneumonia in, 604
complications of, 604
cough in, 603
treatment, 606
delayed rash in, treatment, 606
diagnosis of, 604
differential, 604
ears in, care of, 605
etiology of, 602
eyes in, 603
care of, 605
feeding in, 605
fresh air in, 607
German, 607. See also *German measles*.
incubation period, 603
Koplik spots in, 604
nephritis in, 604
otitis in, 604
prognosis of, 605
quarantine in, 607
rash in, 603
recurrence of second attacks, 604
symptoms of, 603

Measles, temperature in, 603
transmission of, 602
treatment of, 605
vapor in, 607
Mediastinum, emphysema of, 343
Melæna neonatorum, 171
Melancholia, 481
Meltzer and Lamar on Diplococcus pneumoniæ, 317
Membranous proctitis, 260
Memory in new-born infants, 44, 45
Mendel and Rose on carbohydrates, 643
Ménière's disease in tardy hereditary syphilis, 665
Meningeal hemorrhage, 496
Meningitis, acute simple, 529
diagnosis of, 530
differential, 531
diet in, 532
etiology of, 529
lumbar puncture in, 531
pathology of, 530
prognosis of, 531
sedatives in, 532
symptoms of, 530
treatment of, 531
warm packs in, 531
blood in, 393
cerebrospinal, 536. See also *Cerebrospinal meningitis.*
in lobar pneumonia, 321
posterior basic, 537
serosa, 493
tuberculous, 532
age incidence, 532
Babinski's reflex in, 534
diagnosis of, 534
differential, 535
duration of, 536
Kernig's sign in, 534
lumbar puncture in diagnosis of, 535
Oppenheim's reflex in, 534
pathology of, 533
prognosis of, 536
symptoms of, 533
treatment of, 536
withdrawal of cerebrospinal fluid in, 536
Meningocele, 482
of spinal cord, 484
Meningococcus intracellularis, 536, 537
vaccines, 769
Mensi on sclerema, 158
Menstruation and maternal nursing, 30
Mental apathy in cerebrospinal meningitis, 539
development of new-born infant, 43
Mentality in cerebral paralysis, 497, 499
Mentally deficient children, 485
institution treatment, 488
treatment, 488
Menthol in acute rhinitis, 267
Mercury, bichlorid of, 752
in acute hereditary syphilis, 661–663
Mesenteric gland, tuberculosis, 673
treatment of, 674
Metabolic changes as etiologic factor in hemorrhagic diseases of newly born, 172
Metabolism, calcium, tetany and, relation, 476
Metchnikoff on phagocytosis, 765
Method, necessity of, in management of children, 151
Meyers on sclerema, 159
Microcephalic idiot, 483
Microcephalus, 482
craniectomy in, 483
symptoms of, 483
Micrococcus lanceolatus, 317
Micromelia, 701
Midday nap for delicate children, 140
Miliaria, 550
treatment of, 550
Milk, breast-, 31. See also *Breast-milk.*
certified, 54
requirements of New York County Medical Society Milk Commission for production of, 55
commissions, 54
condensed, analysis of, 114
in cholera infantum, 204
in difficult feeding, 114
in marasmus, 87
in out-patient work, 68, 69
contaminated by cow's udder and body, 52
by dirt, 53
by exposure to air in stable, 51
by flies, 53
by openings in pails, 52
by pouring, 51
by utensils, 51
cow's, 49
adaptation of, 58, 70
by alkalis and antacids, 71
by cereal gruels, 72
by malt-soup extract, 73
by peptonization, 73
by sodium citrate, 71
by whey-feeding, 72
symptomatic, 70
addition of, to proprietary foods, 106
bacteria in, harmful, 50
harmless, 50
casein of, 50
curds of, effect of alkalis and antacids on, 71
of cereal gruels on, 72
of peptonization on, 73
of sodium citrate on, 71
examination of, 57
fat of, 50
modification, 59
idiosyncrasies to, 117
in difficult feeding, 115
in marasmus, 86
lactalbumin of, 50
lactose of, 50
mixtures with cream, 60, 61
modification of, 57
at home, 66

Milk, cow's, modification of, aim, 58
by cream and milk mixtures, 60, 61
by dilution, 58
by laboratory methods, 66
by skimmed milk mixtures, 61
by top-milk methods, 63
fat, 59
proteid, 58
sugar, 59
pasteurization of, 108
effect of, on its assimilation, 110
proteids of, 50
modification, 58
quality variable, 65
skimmed, mixtures of, 61
solids of, 49
sterilization of, 108
effect of, on its assimilation, 110
sugar of, 50
modification, 59
crust, 575
diet in scarlet fever, 632
effect of hydrochloric acid on, 96
pepsin on, 96
Eiweiss, 74
in cholera infantum, 205
evaporated, in cholera infantum, 204
in difficult feeding, 114, 115
for traveling, 103
general properties of, 95
grocery, 54
human, 31. See also *Breast-milk*.
in difficult feeding, 113
infection, tuberculosis from, 672
market, standards of, 53
peptonized, 80
completely, 81
for gavage, 80
for nutrient enema, 80
in adaptation, 73
partially, 81
processes, 81
plain, in difficult feeding, 115
protein, 74
in cholera infantum, 205
raw, compared with sterilized or pasteurized milk, 109
safe, how to obtain, in summer, 733
selection of, in summer, 733
set, Holt's, 33
skimmed, in cholera infantum, 203
pancreatinized, as nutrient enema, 123
sterilization of, 108
effect of, on its assimilation, 110
substitutes in cholera infantum, 200
test, Babcock, 57
withdrawal of, in summer, 733
Miller on pyloric stenosis, 193
on salt-free diet in nephritis, 433
Miner's anemia, 246
Mirrors, double, during exercise, 772
Mitral insufficiency, 366
regurgitation, murmur in, 366
treatment, 386
Mitral stenosis, murmur in, 366
treatment, 386
Mixed feeding, 29
Modified milk, 57. See also *Milk, cow's, modification of*.
Moist heat, 754
râles, 305
Mole, hairy, 578
Möller-Barlow's disease, 124. See also *Scurvy*.
Mongolian idiocy, 486
diagnosis, 488
etiology, 486
pathology, 487
rachitis and, differentiation, 132
symptoms, 487
Mongolianism, 486. See also *Mongolian idiocy*.
Mononuclears, large, 390
Monti on rickets, 129
Morbid fears, 481
Morbus comitialis, 512
Herculeus, 512
sacer, 512
Moro inunction test for tuberculosis, 680
on leukocytosis, 391
on pancreatic extract, 79
on starch digestion, 78
Morse on blood findings in diphtheria, 395
Mosher's chair, 777
Mother, education of, 741
nursing, 21. See also *Maternal nursing*.
Motility of stomach, 185
Mouth, angle of, ulcerations and fissures, 182
diseases of, 176
toilet in typhoid fever, 641
Mouth-breathing in adenoids, 292
Mouth-to-mouth artificial respiration in asphyxia neonatorum, 163
Mouth-washing in stomatitis, 179
Mucous colitis, 228. See also *Colitis, mucous*.
membrane, nasal, in transmission of acute poliomyelitis, 517
respiratory, in tardy hereditary syphilis, 665
patches in acute hereditary syphilis, 661
râles, 305
Muenier and Fröhlich on leukocytosis in pertussis, 395
Müller on acute poliomyelitis, 520
on blood findings in poliomyelitis, 393
Multiple neuritis, 522
after diphtheria, 522
treatment, 525
convalescence in, 525
diagnosis, 524
drugs in, 524
electric reactions in, 524
etiology, 522
pathology, 522
prognosis, 524

Multiple neuritis, sensory effects, 523
symptoms, 523
treatment, 524
Mumps, 590
complications of, 592
diagnosis of, 592
differential, 592
duration of, 591
etiology of, 590
incubation period, 591
pathology of, 591
prognosis of, 592
symptoms of, 591
transmission of, 591
treatment of, 592
Murkel on weight of thymus, 414
Murmur, cardiorespiratory, 368
heart, 365. See also *Heart murmurs.*
in congenital heart disease, 377, 378
regurgitant, 365
stenotic, 365
venous, 367
Murphy drip in acute diffuse nephritis, 435
on vaccine treatment of gonorrheal vulvovaginitis, 455
Murray on thyroid medication in cretinism, 704
Muscle irritability in tetany, 477
rigidity in cerebrospinal meningitis, 539
Muscular atrophies, progressive, 507
atrophy, progressive, spinal, 507
ascending type, 510
Charcot-Marie-Tooth type, 508
course of, 510
diagnosis of, 510
Duchenne-Aran type, 508
etiology of, 507
hand type, 508
leg type, 508, 510
pathology of, 507
peroneal type, 508
prognosis of, 510
spastic type, 508, 510
symptoms of, 508
treatment of, 510
dystrophy, primary, 510. See also *Amyotrophy, progressive.*
Musical râles, 303
Mustard bath, 750
in bronchitis, 309
in bronchopneumonia, 335
plaster in acute spasmodic bronchitis, 315
in bronchitis, 309
in lobar pneumonia, 325
Mutton broth, formula for making, 103
Mycotic stomatitis, 176
Myelocystocele, 484
Myelocytes, 390
eosinophilic, 390
Myelomeningocele, 484
Myers on normal temperature, 715
on urinary observations, 417
Myocarditis, 372
Myocarditis, acute parenchymatous, 372
suppurative, 373
chronic interstitial, 373
convalescence in, 375
diagnosis of, 374
drugs in, 374
etiology of, 372
in lobar pneumonia, 321
in scarlet fever, 628
pathology of, 372
strychnin in, 374
symptoms of, 373
treatment of, 374
Myopathy, 507
of facioscapulohumeral type, 510
Myxedema, infantile, 704. See also *Cretinism.*

Nævus, etiology of, 577
flammeus, 578
linearis, 578
lipomatodes, 578
pilosus, 578
pilus, 578
prognosis of, 578
symptoms of, 578
treatment of, 578
verrucosus, 578
Nails in acute hereditary syphilis, 661
Narcosis, gavage in, 761
Nasal catarrh, 268
diphtheria, 617
acute rhinitis and, differentiation, 266
treatment, 618
hemorrhage, 270
treatment, 270
infection, persistent, with bacillus of diphtheria, 618
mucous membrane in transmission of acute poliomyelitis, 517
Naunyn's exercise for empyema, 793
Nauseating drugs, 751
Necrobiosis, 178
Needle, Quincke's, 547
Neisser on Wassermann test for syphilis, 682
Neosalvarsan in acute hereditary syphilis, 664
Nephritis, acute diffuse, 429
bath in, 434
care of bowels in, 434
convalescence in, 436
convulsions in, 431
diagnosis, 432
diet in, 433
duration, 432
etiology, 429
examination of urine in, 432
fever in, 431
fulminating cases, 431
heat in, 435
Murphy drip in, 435
pathology, 429
prognosis, 432

Nephritis, acute diffuse, salt-free diet in, 433
severe cases, treatment, 434
symptoms, 430
time of development, 430
treatment, 432
severe cases, 434
uremia in, 431
treatment, 436
urine in, 431
interstitial, pathology, 430
parenchymatous, 429. See also *Nephritis, acute diffuse.*
chronic diffuse, 437
diagnosis, 438
exacerbation in, 438
pathology, 438
prognosis, 438
symptoms, 438
treatment, 438
interstitial, 440
etiology, 440
symptoms, 440
treatment, 440
climate in, 744
in influenza, 654, 655
in measles, 604
in scarlet fever, 430, 629
treatment, 636
Nervous children, active exercise in, as cause of elevation of temperature, 718
cough, 271, 272
disorders, 456
Netter and Levaditi on acute poliomyelitis, 518, 520
Nettle-rash, 551. See also *Urticaria.*
Neufeld on opsonic index, 766
Neuralgia, intercostal, counterirritants in, 746
Neurasthenia, 481
Neuritis, multiple, 522. See also *Multiple neuritis.*
Neurotic eczema, 574
Neutrophiles, polymorphonuclear, 390
Nevus, 577. See also *Nævus.*
New-born infant, 17
abscess of breast in, 167
absence of bile-ducts in, 166
asphyxia of, 161. See also *Asphyxia neonatorum.*
atelectasis of, 165
treatment, 166
bathing, 20
blood in, 389
specific gravity, 389
consciousness in, 44
cutaneous sensibility in, 44
delayed asphyxia of, 165. See also *Asphyxia neonatorum, delayed.*
diseases of, 153
erythrocytes in, 389
feeding, 18
feeling in, 44
fresh air, 19
hearing in, 44
New-born infant, hemoglobin in, percentage, 389
hemorrhagic diseases, 170. See also *Hemorrhagic diseases of newly born.*
icterus in, 156. See also *Icterus neonatorum.*
inflammation of breast in, 167
laughter of, 45
leukocytes in, 389
mastitis in, 167
treatment, 167
maternal nursing, 21. See also *Maternal nursing.*
melena, 171
memory in, 44, 45
mental development, 43
nutrition and growth, 17
environment as factor, 17
heredity as factor, 17
work and stress as factors, 20
organic sensation in, 44
pemphigus in, 560
physical development, 43
selection and preparation of food, 19
sepsis in, 159. See also *Sepsis in new-born infant.*
sight in, 43
smell in, 44
taste in, 44
tetanus in, 168. See also *Tetanus neonatorum.*
thirst-hunger in, 44
touch in, 44
umbilical granuloma of, 169
treatment, 170
polyp, 167
ventilation, 19
weight of, 40
New-growths of kidney, 426
New York County Medical Society, Milk Commission of, 54
Nicholls and Adami on rickets, 130
on typhoid fever, 638
Nicolaier on tetanus bacillus, 168
Nicoll on inclusion bodies in streptococcous infections, 395
on scarlet fever, 624
Nicoll and Bovaird on weight of thymus, 414
Night feedings, 65
Night-terrors, 457
etiology of, 457
treatment of, 457
Nipple, care of, 31
cracked, 35
treatment of, 36
depressed, 36
fissure of, 35
treatment, 37
for nursing-bottle, 47
care of, 48
leaking, 35
Nipple-shield, 31
Nitroglycerin in lobar pneumonia, 326
Nitrous oxid gas as anesthetic, 721, 722

Noguchi butyric-acid test for syphilis, 683
luetin test for syphilis, 684
on acute poliomyelitis, 516
on Treponema pallidum, 657
Noma, 180
Northrup on cold-air treatment in pneumonia, 324
on sclerema, 159
Nose and throat, care of, in scarlet fever, 634
diseases of, 266
foreign bodies in, as cause of chronic rhinitis, 269
Nourishment in diphtheria, 616
Nurse, wet-, 34
in cholera infantum, 204
selection of, 34
Nursery, 37
airing of, 38
floor of, 38
for delicate children, 139
furniture of, 38
heating of, 38
maid, 39
gonorrhea in, 39
physical examination, 39
schools for training, 39
shades for, 38
ventilation of, 38
Nursing in scarlet fever, 632
maternal, 21. See also *Maternal nursing.*
Nursing-bottle, 47
care of, 47, 48
nipple for, 47
care of, 48
Nutrient enema, 121
amount of nourishment, 123
in acute illness, 148
method of giving, 121
nourishment not to be used, 122
to be used, 123
peptonized milk for, 80
Nutrition and growth of new-born infant, 17. See also *New-born infant, nutrition and growth.*
disorders of, 81
errors in, in tardy hereditary syphilis, 667
Nutritional errors a factor in artificial feeding, 48

Oatmeal jelly, formula for making, 104
Oatmeal-water, formula for making, 105
Obesity, 722
diet in, 722
drugs in, 723
exercise in, 723
treatment of, 722
Obstetric paralysis, 526. See also *Erb's paralysis.*
Obstinate constipation, diet in, 242
oil injections in, 242
treatment of, 242
vomiting, gavage in, 759
Obstructive jaundice, 264
O'Dwyer intubation set, 619, 620
Oïdium albicans, 176
Oil injections in constipation in bottle-fed, 238
in obstinate constipation, 242
inunctions, 120
in tetany, 480
Oils, 752
Olivier on weight of thymus, 414
Ophthalmic tuberculin test for tuberculosis, 680
Oppenheimer on blood-pressure, 396
Oppenheim's reflex in tuberculous meningitis, 534
Opsonic index, determination of, 765
Opsonins, 765
Orange-juice in scurvy, 127
Orchitis, 448
pathology of, 448
symptoms of, 449
treatment of, 449
Ord on cretinism, 705
Organic sensation in new-born infant, 44
Orth on localization of lobar pneumonia, 318
Osgood on acute poliomyelitis, 517
Osler on polycythemia in congenital cyanosis, 396
on thyroid medication in cretinism, 704
Osteomyelitis, staphylococcus vaccines in, 767
streptococcus vaccines in, 768
Otitis, acute, 580
bacteriology of, 580
complications of, 582
course of, 582
delayed resolution in, treatment, 584
diagnosis of, 582
etiology of, 580
fever in, 581
prognosis of, 582
symptoms of, 581
treatment of, 582
operative, 583
post-operative, 583
types of, 580
as cause of elevation of temperature, 720
chronic suppurative, 585
treatment, 585
in influenza, 654
in lobar pneumonia, 322
in measles, 604
in scarlet fever, 628
treatment, 635
media, pseudodiphtheria bacillus in treatment of, 769
staphylococcus vaccines in, 767
streptococcus vaccines in, 768
Otten on Diplococcus pneumoniæ, 317
Outdoor life in marasmus, 85
Oxygen in bronchopneumonia, 338
Oxyuris vermicularis, 247
rectal injections in, 248
symptoms, 247
treatment, 248

Pacifier, use of, 463
Pack, cold, in fever of bronchopneumonia, 338
cool, 747
Packs in scarlet fever, 633
Paine on bacteriology of chorea, 501
Paine and Poynton on rheumatism, 688
on streptococcus of rheumatism in vegetations of heart valves, 378
Pains, growing, 687
Palate, cleft-, 182. See also *Cleft-palate.*
Palpation in acute endocarditis, 380
in bronchitis, 307
in bronchopneumonia, 330
in diseases of heart, 365
in lobar pneumonia, 323
of lungs, 300
of thymus gland, 414
of tumor in pyloric stenosis, 195
Palsy. See *Paralysis.*
Paltauf on status lymphaticus, 416
on tetany, 476
Pancreas, tuberculosis of, 360
Pancreatic ferments in young infants, 79
Pancreatinized skimmed milk as nutrient enema, 123
Papper and Landsteiner on acute poliomyelitis, 517
Paracelsus on chorea, 500
on cretinism, 704
Paralysis, bulbar, progressive, 508, 510
cerebral, 495
acquired form, 498
age incidence, 498
athetosis in, 499
diagnosis of, 499
disturbances of speech in, 499
electric reaction in, 499
epilepsy in, 499
etiology of, 498
incoördinate movements in, 499
mentality in, 499
sensation in, 499
symptoms of, 498
birth form, 495
diagnosis of, 499
epilepsy in, 497
etiology of, 495
lesions of, 496
mentality in, 497
symptoms of, 496
postnatal form, 498
prenatal form, 495
diagnosis of, 499
epilepsy in, 497
etiology of, 495
lesions of, 496
mentality in, 497
symptoms of, 496
treatment of, 500
Erb's, 526. See also *Erb's paralysis.*
facial, 526
treatment of, 526
infantile, 516. See also *Poliomyelitis, acute.*
obstetric, 526. See also *Erb's paralysis.*
Paralysis, wasting, 507
Paralytic ileus, treatment, 206
Paraphimosis, 447
treatment of, 447
Paraplegia, 498
Parasites, intestinal, 246
blood in infections by, 246
Parasitic diseases, eosinophilia in, 394
Park on prevention of acute intestinal diseases of summer, 217
Park and Krumweide on tuberculosis, 670, 671, 675
Parotitis, epidemic, 590. See also *Mumps.*
specific, 590. See also *Mumps.*
Paroxysmal hemoglobinuria, 424
Parrot on chondrodystrophia, 701
on sclerema, 158
Parsons on bacteria in milk, 50
Pasteurization of milk, 108
effect of, on its assimilation, 110
Pasteurizer, Freeman, 109
Pastia on acute poliomyelitis, 517
Patellar reflex in cerebrospinal meningitis, 541
Pavor diurnus, 456
of intestinal origin, 211
nocturnus, 457
treatment, 457
Peabody and Draper on acute poliomyelitis, 517
Peabody, Draper, and Dachez on acute poliomyelitis, 393, 518, 520, 521
Peabody, Flexner, and Draper on acute poliomyelitis, 516
Pearce on icterus, 157
Pediculi, 556
capitis, 556
treatment, 556
Peliosis rheumatica, 691
treatment, 691
Pemphigus neonatorum, 560
treatment, 560
Pen, exercise, 737
Pepsin, effect of, on milk, 96
Peptonized milk, 80
completely, 81
for gavage, 80
for nutrient enema, 80
in adaptation, 73
partially, 81
processes, 81
Percussion in acute endocarditis, 380
in bronchitis, 307
in bronchopneumonia, 330
in diseases of heart, 365
in emphysema, 343
in interstitial pneumonia, 340
in lobar pneumonia, 323
in pericarditis, 370
in secondary pleurisy, 346
of lungs, 300
of thymus gland, 414
Perforation in typhoid fever, 640
treatment, 646
Peri-arthritis, acute, diagnosis of, 728

Peri-arthritis in lobar pneumonia, 322
Pericarditis, 369
bacteriology of, 369
diagnosis of, 370
in lobar pneumonia, 321
in scarlet fever, 628
pathology of, 369
percussion in, 370
physical signs, 370
prognosis of, 371
purulent type, treatment of, 372
symptoms of, 369
treatment of, 371
Pericardium, adherent, 387
Periodic fever, 696
as cause of elevation of temperature, 720
treatment, 697
vomiting, 691. See also *Cyclic vomiting.*
Periostitis in tardy hereditary syphilis, 667
Peristaltic wave in pyloric stenosis, 194
method of obtaining, 195
Peritoneum, diseases of, 184
sepsis of, in new-born, 160
tuberculosis of, 360
chronic, 674. See also *Tuberculous peritonitis, chronic.*
Peritonitis, acute general, 255
appendicitis and, differentiation, 254
as complication, 255
diagnosis, differential, 256
duration, 256
intussusception and, differentiation, 256
pathology, 255
prognosis, 256
symptoms, 256
blood in, 393
in lobar pneumonia, 322
tuberculous, chronic, 674. See also *Tuberculous peritonitis, chronic.*
Peritonsillar abscess, 282
symptoms, 283
treatment, 283
Perlin on blood in new-born, 389
Permanent teeth, 174
Pernicious anemia, 402
symptoms, 403
Pertussis, 593. See also *Whooping-cough.*
Petechial fever, 536
Peterson on mental development of newly born, 43
Petit mal of epilepsy, 513
Pfaundler on capacity of stomach, 184
on pyloric stenosis, 191, 192
on stomach of infant, 184
Pfeiffer on influenza bacillus, 650
Phagocytic index, 766
Pharyngeal tonsil, 279
Pharyngitis, 274
treatment of, 274
Phimosis, 446
as cause of convulsions, 470
treatment of, 446
Phosphorus in rachitis, 134
Phthisis, 357. See also *Tuberculosis, pulmonary.*
Physical development of new-born infant, 43
Physician, care by, in visiting infectious and contagious diseases, 588
Picking finger-tips, 464
Piersol on pharyngeal tonsil, 279
Pigeon-breast, 299
in rachitis, 130, 131
Pigmies, 710
Pin-worms, 247
rectal injections in, 248
symptoms, 247
treatment, 248
Pirquet and Schick on serum disease, 685
Pirquet's tuberculin test for tuberculosis, 679
Plasmodium malariæ, 646
species, 647
Platinger on blood findings in measles, 395
Pleura, adherent, as cause of cough, 272
Pleurisy, appendicitis and, differentiation, 254
counterirritants in, 745, 746
dry, 345
empyema and, differentiation, 350
fibrinous, 345
primary, 344
pathology of, 344
symptoms of, 344
treatment of, 344
rheumatic, 691
treatment of, 691
secondary, 345
aspiration in, 347
auscultation in, 346
bacteriology of, 345
diagnosis of, 346
etiology of, 345
exploratory puncture in, 346
pathology of, 345
percussion in, 346
symptoms of, 346
treatment of, 346
tuberculous, 345
with purulent effusion, 345, 347. See also *Empyema.*
Pleuritic effusion, lobar pneumonia and, differentiation, 323
Pneumococcus, 317
infection, acute, of lungs, 313
vaccines, 769
in empyema, 769
Pneumonia, 317
appendicitis and, differentiation, 254
blood in, 392
broncho-, 328. See also *Bronchopneumonia.*
catarrhal, 328. See also *Bronchopneumonia,*
climate in, 743
empyema and, differentiation, 351

Pneumonia, fibrinous, 317. See also *Pneumonia, lobar.*
hypostatic, 341
interstitial, 338
auscultation in, 339
diagnosis of, 339
differential, 340
gymnastic exercises in, 341
pathology of, 339
percussion in, 340
prognosis of, 340
symptoms of, 339
treatment of, 341
lobar, 317
alcohol in, 327
auscultation in, 323
bowels in, 325
clothing in, 324
cold air in, 324
complications in, 321
consolidation of lungs in, 322
counterirritation in, 325, 745
delayed crisis in, 321
delirium in, 321
diagnosis of, 322
differential, 323
diarrhea in, 321
diet in, 325
digitalis in, 327
duration of attack, 319
empyema in, 322, 349
etiology of, 317
fever in, treatment, 325
gavage in, 327
heart stimulants in, 326
hydrotherapy in, 325
hypodermic stimulation in, 327
localization of lesions in, 318
meningitis in, 321
mustard plaster in, 325
myocarditis in, 321
nitroglycerin in, 326
otitis in, 322
palpation in, 323
pathology of, 318
percussion in, 323
peri-arthritis in, 322
pericarditis in, 321
peritonitis in, 322
physical signs, 323
pleuritic effusion and, differentiation, 323
predisposition to, 318
prognosis of, 322
sick-room in, 324
specific medication in, 328
stage of congestion, 318
of gray hepatization, 318
of red hepatization, 318
of resolution, 318
strophanthus in, 326
strychnin in, 326
stupor in, 321
symptoms of, 319
unfavorable, 320
temperature in, 320
tympanites in, 321
vocal fremitus in, 323
vomiting in, 321
pyrexia in, treatment, 325
Pneumothorax, 342
auscultation in, 342
physical signs, 342
prognosis of, 342
symptoms of, 342
treatment of, 342
Point, McBurney's, 251
Poisoning, ivy, 552
treatment of, 552
rhus, 552
treatment of, 552
thymol, 250
Polioencephalitis, 519
Poliomyelitis, acute, 516
abortive type, 518, 519
age incidence, 518
blood in, 393
bulbar spinal group, 518
cerebral type, 518, 519
cerebrospinal fluid in, 517
course of, 520
electric reactions in, 520
etiology of, 516
exercises for, 809
immunity to, 518
massage in, 811
nasal mucous membrane in transmission of, 517
pathology of, 516
period of incubation, 518
prognosis of, 520
quarantine in, 521
scurvy and, differentiation, 126
seasonal influences, 518
symptoms of, 518
transmission of, 517
treatment of, 521
virus in, 517
chronic anterior, 507
Polymorphonuclear neutrophiles, 390
Polyp, umbilical, in new-born infant, 167
Polyuria, persistent, 710
Porak on chondrodystrophia, 701
Porencephalus, 483
Pork-worm, 249
Port-wine stain, 578
Posterior basic meningitis, 537
Posthemiplegic chorea, 500
Posture, 774
Adams', 790
as aid in diagnosis, 143
bad, correct sitting to correct, 780
standing to correct, 780
exercise in, 777
lying in correct position to correct, 780
shot-bag exercise for, 779
static exercises for, 779
walking movements for, 779
clothing in, 775
heredity in, 777

Posture in school, 777
in sleep, 776
Potash, chlorate of, in stomatitis, 179
dangers, 180
in tonsillitis, 282
iodid of, 752
Pott on tetany, 476
Poynton on bacteriology of chorea, 501
on citrate of soda for preventing solid coagulation of casein, 71
Poynton and Paine on rheumatism, 688
on streptococcus of rheumatism in vegetations of heart valves, 378
Premature infants, 153
artificial heat, 153
electrotherm for, 153, 154
feeding of, 154
fresh air for, 154
Prepuce, adherent, 445
Prickly heat, 550
treatment, 550
Prizner and Lucas on measles, 603
Proctitis, 260
catarrhal, 260
membranous, 260
symptoms, 260
treatment, 261
ulcerative, 260
Progressive amyotrophy, 507, 510. See also *Amyotrophy, progressive.*
bulbar paralysis, 508, 510
muscular atrophies, 507
spinal muscular atrophy, 507. See also *Muscular atrophy, progressive spinal.*
Prolapse of anus and rectum, 257
treatment, 257
Proprietary foods, 76, 105
addition of fresh cow's milk, 106
beef, 107
dried-milk, 106
Prosek on scarlet fever, 624
Proteid as cause of constipation in bottle-fed, 237
diet in tetany, 480
milk, 74
in cholera infantum, 205
of breast-milk, 32, 33
of cow's milk, 50
modification of, 58
Pseudodiphtheria bacillus in treatment of otitis media, 769
Pseudoleukemic anemia of von Jaksch, 400
treatment, 401
Pseudomembranous ileocolitis, 221
Pseudomuscular hypertrophy, 510
Pseudoparalysis, syphilitic, 661
Psychic disorders, 480
Pulmonary abscess, 356
gangrene, 356
stenosis, 366
tuberculosis, 357. See also *Tuberculosis, pulmonary.*
Pulse in typhoid fever, 639
Pump, breast-, 36
Puncture, exploratory, in secondary pleurisy, 346
lumbar, 547. See also *Lumbar puncture.*
Purpura, 403
fulminans, 403
hemorrhagic, 403
Henoch's, 403
prognosis of, 405
serum treatment, 405
simple, 403
treatment of, 403
Pus in urine, 424
Pyelitis, 440. See also *Pyelocystitis.*
Pyelocystitis, 440
age incidence, 440
as cause of elevation of temperature, 720
bacillus coli communis in, 769
diagnosis of, 442
differential, 442
duration of, 444
etiology of, 440
symptoms of, 441
treatment of, 444
urotropin in, 442
vaccine treatment, 443
Pyloric spasm, hypertrophic pyloric stenosis and, differentiation, 195
stenosis, 191
age incidence, 191
appetite in, 194
catheter feeding in, 197
constipation in, 194
diagnosis, 194
diet in, 197
etiology, 192
hypertrophic, combined obstruction and, differentiation, 196
pyloric spasm and, differentiation, 194
loss in weight in, 194
palpation of tumor in, 195
pathology, 193
peristaltic wave in, 194
method of obtaining, 195
postoperative treatment, 197
prognosis, 196
rectal medication in, 198
sex incidence, 192
symptoms, 194
treatment, 197
non-operative, 197
operative, 197
postoperative, 197
vomiting in, 194, 218
Pyonephrosis, 427
Pyromania, 481
Pyuria, 424

Quarantine in acute poliomyelitis, 521
in diphtheria, 615
in influenza, 656
in measles, 607
in scarlet fever, 629

Quarantine in varicella, 590
Quiet in scarlet fever, 633
Quincke on icterus, 157
Quincke's needle, 547
Quinin, 752
in malaria, 649
in whooping-cough, 598
Quinsy, 282
treatment of, 283
Quiserne and Vaquez on polycythemia in congenital heart disease, 396

Rach on Treponema pallidum in cerebrospinal fluid, 684
Rachford on cyclic vomiting, 692, 693
on rheumatoid arthritis, 700
Rachitic chest, 299
rosary, 130
Rachitis, 127
after first year, 128
after prolonged nursing, 129
age incidence, 128
as cause of convulsions, 469
associated with other diseases, 129
changes in bones in, 129, 130
craniotabes in, 130, 131
cretinism and, differentiation, 132
deformities in, treatment, 134
diagnosis, 131
differential, 132
diet after first year, 133
diet in, 132
drugs in, 134
etiology, 127, 128
fetal, 701
funnel-chest in, 131
Harrison's grooves in, 131
hydrocephalus and, differentiation, 132
hygiene in, 133
in breast-fed, 128
mongolianism and, differentiation, 132
pathology, 129
phosphorus in, 134
pigeon-breast in, 130, 131
prognosis, 132
rosary of, 130
scurvy-, 124
symptoms, 130
theories of pathogenesis, 129
treatment, 132
Radical removal of tonsils and adenoids, 296, 297
adhesions after, 298
benefits from, 298
Râles, 304
moist, 305
mucous, 305
musical, 303
sibilant, 305
sonorous, 304
squeaking, 303
Ramsey on pyloric stenosis, 193
Rarefied air apparatus in emphysema, 797
Rash, delayed, in measles, treatment, 606
Rash in acute hereditary syphilis, 659
in German measles, 607
in measles, 603
in varicella, 589
Raw milk compared with sterilized or pasteurized milk, 109
Reckzan on blood findings in scarlet fever, 395
Record antitoxin syringe, 614
history, 144
Rectal feeding, 121
amount of nourishment, 123
in acute illness, 148
nourishment not to be used, 122
to be used, 123
injections in oxyuris vermicularis, 248
medication in laryngismus stridulus, 474
in pyloric stenosis, 198
Rectum and anus, diseases of, 257
prolapse of, 257
treatment, 257
in children, 257
inflammation of, 260. See also *Proctitis.*
Recurrent bronchitis, 311. See also *Bronchitis, recurrent.*
vomiting, 691. See also *Cyclic vomiting.*
Red hepatization in lobar pneumonia, 318
Reed on Hodgkin's disease, 405
Reflex, Babinski's, in cerebrospinal meningitis, 540
in tuberculous meningitis, 534
eczema, 574
Oppenheim's, in tuberculous meningitis, 534
patellar, in cerebrospinal meningitis, 540
Regurgitant murmur, 365
Regurgitation, aortic, murmur in, 367
mitral, murmur in, 366
treatment of, 386
Resolution in lobar pneumonia, 318
Resonance of chest, 300
tympanitic, of chest, 300
Resorts, summer, 738
Respiration, amphoric, 303
artificial, in asphyxia neonatorum, 163, 164
asthmatic, 303
bronchial, 303
distant, 302
bronchovesicular, 303
cavernous, 303
diminished, 302
emphysematous, 303
expiration, 301, 302
in cerebrospinal meningitis, 539, 541
inspiration, 301, 302
variations in, 299
vesicular, 301
distant, 301
exaggerated, 301, 302
weakened, 302

Respiratory cycle, 301
exercises in emphysema, 796
tract, diseases of, 266
Rest treatment of chorea, 503
Restlessness in acute hereditary syphilis, 658
Retention of urine, 418
treatment, 419
Retropharyngeal abscess, 277
acute, 275
age incidence, 275
etiology of, 275
fever in, 277
location of, 275
symptoms of, 275
treatment of, 277
spasmodic croup and, differentiation, 285
adenitis, 274
spasmodic croup and, differentiation, 285
treatment, 274
Rhabdomyosarcoma of kidney, 427
Rheumatic fever, 697
counterirritants in, 746
drugs in, 699
etiology, 698
precautions, 698
prognosis, 698
symptoms, 698
treatment, 698
pleurisy, 691
treatment, 691
recurrent bronchitis, 690
Rheumatism, 687
acute, 697. See also *Rheumatic fever.*
articular, 697. See also *Rheumatic fever.*
age incidence, 688
bath in, 689
blood in, 393
chorea and, relation, 501
diet in, 688
drugs in, 689
etiology of, 688
scurvy and, differentiation, 126
treatment of, 688
Rheumatoid arthritis, 700
treatment, 701
Rhinitis, acute, 266
complications of, 267
diagnosis, differential, 266
duration of, 267
influenza and, differentiation, 266
measles and, differentiation, 266
nasal diphtheria and, differentiation, 266
symptoms of, 266
treatment of, 267
chronic, 268
etiology of, 268
treatment of, 269
in acute hereditary syphilis, 658
in adenoids, 292
Rhus poisoning, 552
treatment, 552
Rhus toxicodendron, 552
Rice-water, formula for making, 104
Rickets, 127. See also *Rachitis.*
Rieder on leukocytes, 390
Ring-worm, 556
diagnosis of, 557
etiology of, 556
of scalp, 557
diagnosis, 558
etiology, 557
prophylaxis, 558
treatment, 558
of tongue, 181
symptoms of, 556
treatment of, 557
Rohn on percussion of thymus, 415
Rolleston on blood-pressure, 396, 397
Rollier on treatment of surgical tuberculosis, 677
Rollier's treatment of surgical tuberculosis, 677
Romanowitch on trichina, 251
Room temperature in acute illness, 146
Rosary, rachitic, 130
Rose spots in typhoid fever, 639
Rose and Mendel on carbohydrates, 643
Rosenstern on tetany, 476
Ross on injections of pneumococci in empyema, 769
Rotch on capacity of stomach, 184
on milk laboratories, 66
Rötheln, 607
Round shoulders, exercises for, 785
Round-worms, 246
symptoms, 247
treatment of, 247
Roux on diphtheria, 609
Rubella, 607
Rudolf on coagulation time of blood, 397
Running away impulse, 481
Russell on dietetics and food economics, 22
on typhoid carriers, 638
on vaccination in typhoid fever, 768

Sabbatini on tetany, 476
Saber deformity in tardy hereditary syphilis, 666
Sachs on amaurotic family idiocy, 489, 491
on cerebral palsy, 496
on hydrocephalus, 492, 494
on microcephalus, 482
on primary dystrophies, 511
Sainton on dwarfs, 709
Salicylate of soda, 751
Salt solution in cholera infantum, 203
Salt-free diet in acute diffuse nephritis, 433
Salts, ammonium, 752
Salvarsan in acute hereditary syphilis, 663, 664
Sanitarium treatment of tuberculosis, 744
Sappey on thymus in new-born, 413
on weight of thymus, 414

Sarcoma, 722
of brain, 485
of kidney, 427
as cause of intestinal obstruction, 245
of spleen, 262
Satterthwaite's method of artificial respiration in emphysema, 796
Scabies, 553
treatment of, 553
Scales for weighing, 42
Scalp, ring-worm of, 557. See also *Ring-worm of scalp.*
Scarlatina, 623. See also *Scarlet fever.*
Scarlet fever, 623
adenitis in, 628
treatment, 634
albuminuria in, 628
alcohol in, 634
angina in, 626
arthritis in, 629
treatment, 636
bacteriology, 624
blood in, 395
bowels in, 632
bronchopneumonia in, 628
cardiac involvement in, 636
care of nose and throat in, 634
clothing in, 631
complications, 628
treatment of, 634
contagion, 624
control of fever, 633
desquamation, 626
diagnosis, 627
diet in, 631
diphtheria in, 628
effect of removal of tonsils and adenoids on, 298
endocarditis in, 628
etiology, 624
German measles and, differentiation, 608
incubation period, 626
kidney of, 430
laxatives in, 632
membranous non-diphtheric angina in, 628
milk diet in, 632
mortality, 629
myocarditis in, 628
nephritis in, 430, 629
treatment, 636
nursing in, 632
oil inunction in, 634
otitis in, 628
treatment, 635
packs in, 633
pericarditis in, 628
prophylaxis, 629
quarantine, 629
quiet in, 633
second attacks, 625
desquamation, 627
serum treatment, 632
severity, 627
Scarlet fever, sick-room in, 631
stimulants in, 634
strawberry tongue in, 627
streptococcous vaccines in, 768
surgical, 637
susceptibility, 625
symptoms, 626
transmission, 624
treatment, 630
complications, 634
tub-baths in, 633
urine examinations in, 631
Schaudinn and Hoffman on Spirochæta pallida, 657
Schick and von Pirquet on serum disease, 685
Schiff on blood in new-born, 389
on thyroid grafting in cretinism, 704
Schloss on food idiosyncrasies, 118, 119
School for training nursery maids, 39
in chorea, 503
posture in, 777
Schultze's method of artificial respiration in asphyxia neonatorum, 164
sign in tetany, 478
Scientific infant-feeding, 111
Scipiades on blood in new-born, 389
Scleredema, sclerema neonatorum and, differentiation, 159
Sclerema neonatorum, 158
diagnosis, 159
etiology, 158
pathology, 158
prognosis, 159
scleredema and, differentiation, 159
scleroderma and, differentiation, 159
symptoms, 159
treatment, 159
Scleroderma, sclerema neonatorum and, differentiation, 159
Sclerosis, amyotrophic lateral, 507, 508
Scoliosis, 788
Adams' position in, 790
diagnosis of, 789
exercises for, 790
key-note position in, 792
treatment of, 790
Scorbutus, 124. See also *Scurvy.*
Scripture on treatment of tics, 505
Scurvy, 124
age incidence, 124
diagnosis, differential, 126
etiology, 124, 125
pathology, 124
poliomyelitis and, differentiation, 126
prognosis, 126
rheumatism and, differentiation, 126
symptoms, 125
syphilis and, differentiation, 126
treatment, 127
Scurvy-rickets, 124
Seborrhea, 575
Seborrhœa capitis, 575
treatment, 576
intertrigo, 576
treatment, 576

Second heart-sound, 363
summer, diet in, 96
Sedatives in convulsions, 471, 472
Seguin on Fowler's solution in chorea, 504
Seibert on lavage, 756
on non-milk diet in typhoid fever, 641
Seligmüller on tetany, 476
Senile chorea, 500
Sensation in cerebral paralysis, 499
Sepsis in new-born infant, 159
alcohol in, 161
etiology, 159
parts most frequently involved, 160
prognosis, 160
prophylaxis, 160
sources of infection, 159
treatment, 160
Septicemia, staphylococcus vaccines in, 767
Sergeant on blood-pressure, 396
Serum disease, 685
Flexner's, in cerebrospinal meningitis, 542–546
treatment of acute ileocolitis, 225
of hemorrhagic diseases of newly born, 173
of purpura, 405
of scarlet fever, 632
Shades for nursery, 38
Shaffer on amaurotic family idiocy, 491
Shennan on acute diffuse nephritis, 430
on tuberculous meningitis, 533
Shield, nipple-, 31
Shorer on vaccine therapy in erysipelas, 768
Shot-bag exercise for bad posture, 779
Shoulders, round, exercises for, 785
Sibilant râles, 305
Sick, bathing of, 750
Sick-room in acute illness, 146, 149
in bronchopneumonia, 333
in lobar pneumonia, 324
in scarlet fever, 631
Siegert on rickets, 127
Sight of new-born infant, 43
Sign, Chvostek's, in tetany, 477
Kernig's, in cerebrospinal meningitis, 540
in tuberculous meningitis, 534
Schultz's, in tetany, 478
Trousseau's, in tetany, 478
Silverman on intestinal obstruction, 244
Sinus thrombosis, 586
symptoms, 586
treatment, 586
Skimmed milk in cholera infantum, 203
mixtures, 61
pancreatinized, as nutrient enema, 123
Skin, care of, in health, 549
changes in tardy hereditary syphilis, 665
diseases of, 549
in cerebrospinal meningitis, 539
Skin reactions, tuberculin, in infancy, 681
sepsis of, in new-born, 160
Skull, fracture of, depressed, cephalhematoma and, differentiation, 156
Sleep, 47
inspection during, 144
posture in, 776
Sleeping rooms for delicate children, 139
Smell of new-born infant, 44
Snuffles, 266
Soda bath, 750
salicylate of, 751
Sodium citrate in milk adaptation, 71
Solis Cohen on blood in tuberculosis, 393
Sonorous râles, 304
Soor, 176
Sophian on cerebrospinal meningitis, 545
Sore throat, streptococcus, 279
Spasm, habit, 505
chorea and, differentiation, 502
treatment of, 506
of larynx, 472. See also *Laryngismus stridulus*.
pyloric, hypertrophic pyloric stenosis and, differentiation, 195
Spasmodic bronchitis, acute, 312. See also *Bronchitis, acute spasmodic*.
croup, 284. See also *Croup, spasmodic*.
Spasmophilia, 476
Spasmus nutans, 458
treatment, 458
Specific gravity of blood in newly born, 389
of urine, 417
Speech, 45
disturbances of, in cerebral paralysis, 499
exercises for, in congenital ataxia, 808
Spencer on success in life, 22
Spermatic cord, hydrocele of, 449
encysted, 450
Spina bifida, 484
diagnosis, 484
prognosis, 484
treatment, 485
Spinal ataxia, hereditary, exercises for, 797–809
cord, malformations of, 482
meningocele of, 484
muscular atrophy, progressive, 507. See also *Muscular atrophy, progressive spinal*.
Spine, lateral curvature, 788. See also *Scoliosis*.
tuberculosis of, diagnosis, 728
Spirochæta pallida, 657
Spleen, abscess of, 262
angioma of, 262
carcinoma of, 262
cysts of, 262
diseases of, 262
enlargement of, 262
fibroma of, 262
in acute hereditary syphilis, 659
in Hodgkin's disease, 405

Spleen in leukemia, 402
in tardy hereditary syphilis, 668
in typhoid fever, 639
sarcoma of, 262
tuberculosis of, 359
tumors of, 262
Splenomegaly, 262
Splenomyelogenous leukemia, 401
Sponging, cold, in fever, 746
in acute illness, 146
Spots, rose, in typhoid fever, 639
Spratling on epilepsy, 512
Sprue, 176
symptoms, 176
treatment, 176
Sputum, care of, in phthisis, 362
method of obtaining, in phthisis, 358
Squeaking râles, 303
St. Vitus' dance, 500. See also *Chorea.*
Stadelmann on icterus, 157
Stain, port-wine, 578
Staphylococcus vaccines, 766
in acne, 767
in empyema, 767
in furunculosis, 767
in osteomyelitis, 767
in otitis media, 767
in septicemia, 767
in styes, 767
in suppuration, 767
Starch and opium in acute ileocolitis, 224
bath, 750
digestion in young infants, 77
feeding, 76
Static exercises for bad posture, 779
Status lymphaticus, 415
weight of thymus gland in, 414
Steam atomizer, Arnold, 600
inhalations in bronchitis, 308
in bronchopneumonia, 334
in spasmodic croup, 288
in whooping-cough, 597, 600
Stelwagon on sclerema, 159
Stenosis, mitral, murmur in, 366
treatment of, 386
of esophagus, congenital, 183
pulmonary, 366
pyloric, 191. See also *Pyloric stenosis.*
Stenotic murmur, 365
Sterilization of milk, 108
effect of, on its assimilation, 110
Sterilizer, Arnold, 108
Sternocleidomastoid, hematoma of, 723
Stethoscope, 304, 305
Bowles', 305, 306
Stiles on trichiniasis, 251
Still on polycythemia in congenital heart disease, 396
on pyloric stenosis, 191, 192, 193, 195, 197
on rheumatic complex, 687
on tuberculosis, 673, 674, 675
Stilling on cretinism, 705
Still's disease, 700
Stimulation in acute illness, 149
Stoeltzner on tetany, 476
Stomach, anatomy of, 184
capacity of, 184
cough, 271
digestion in, 184
duration, 185, 186
dilatation of, chronic, 188
symptoms of, 188
treatment of, 188
in older children, 189
vomiting in, 218
diseases of, 184
hemorrhage from, 189
lavage of, in habitual vomiting, 191
motility of, 185
stuttering, 193
tuberculosis of, 359
ulceration of, 190
treatment, 190
washing. See *Lavage of stomach.*
Stomach-feeding, substitute for, 119
Stomach-tube, 759
Stomach-washing, 756. See also *Lavage.*
Stomatitis, 177
aphthous, 177
bacteriology, 177
catarrhal, 177
chlorate of potash in, 179
dangers, 180
drugs in, 179
etiology, 177
feeding in, 179
mouth-washing in, 179
mycotic, 176
prognosis, 179
symptoms, 178
treatment, 179
after ulceration, 179
ulcerative, 177
Stone in bladder, 444
Stool, bacilli in, in phthisis, 359
Strait-jacket in eczema intertrigo, 571
Thomas' modified, 572, 573
Strangulated hernia causing intestinal obstruction, 245
Straus milk charity, 67
Strawberry tongue in scarlet fever, 627
Streptococcus sore throat, 279
vaccines, 767
in adenitis, 768
in erysipelas, 768
in osteomyelitis, 768
in otitis media, 768
in scarlet fever, 768
Stress and work as factors in nutrition and growth of new-born infant, 20
Strophanthus in bronchopneumonia, 336
in chronic valvular disease of heart, 387
in lobar pneumonia, 326
Strouse and Abt on traumatic diabetes, 711
Strümpell on chorea, 501
on polioencephalitis, 519
Strychnin, 753
in bronchopneumonia, 336
in lobar pneumonia, 326

Strychnin in myocarditis, 374
Stump of umbilical cord, care of, 43
Stupor in lobar pneumonia, 321
Stuttering, stomach, 193
Styes, staphylococcous vaccines in, 767
Subcutaneous emphysema, 343
inoculation with tuberculin in diagnosis of tuberculosis, 679
Substitute breast-feeding, 48
feeding, Chapin dipper for, 60
condensed milk and, 68, 69
for dispensary patients, 67
full milk, 68
laboratory methods, 66
modifying milk, 57
number of feedings, 61–64
Sucking, finger-, 463
Sugar in breast-milk, 33
of cow's milk, 50
modification of, 59
Suggestions in management, 729
Summer, acute intestinal diseases of, etiology, 215
prevention, 214–218
diarrhea, instructions for, 737
instructions for, 733
resorts, 738
second, feeding in, 96
Suppositories in constipation in bottle-fed, 238
in nurslings, 237
in older children, 241
Suppression in acute illness, 148
of urine, 418
treatment, 419
Suppuration, staphylococcous vaccines in, 767
Suppurative adenitis, treatment, 408
mastitis, 37
otitis, chronic, 585
Supratonsillar fossa, 278
Surgical scarlet fever, 637
tuberculosis, heliotherapy in, 677
Rollier's treatment, 677
Sydenham on chorea, 500
Sylvester's method of artificial respiration in emphysema, 796
in empyema, 793
Syphilis, 657
acquired, 664
treatment of, 664
acute hereditary, 658
acute epiphysitis in, 661
blood in, 394
condyloma in, 660
convalescence, 663
fissures in, 661
hemorrhage in, 661
hoarseness in, 659
liver in, 659
mercury in, 661–663
mucous patches in, 661
nails in, 661
neosalvarsan in, 664
rash in, 659
restlessness in, 658
Syphilis, acute hereditary, rhinitis in, 658
salvarsan in, 663, 664
spleen in, 659
symptoms, 658
treatment, 661
later, 663
as etiologic factor in hemorrhagic diseases of newly born, 171
complement fixation test for, 683
congenital, 658. See also *Syphilis, acute hereditary.*
deviation test for, 683
Noguchi butyric-acid test for, 683
luetin test for, 684
scurvy and, differentiation, 126
tardy hereditary, 665
blood-vessels in, 666
bones in, 666, 667
deafness in, 665
ear changes in, 665
errors in nutrition in, 667
eye changes in, 665, 668
Hutchinson's teeth in, 667
joint affections in, 667
liver in, 666, 668
lymph-nodes in, 666, 668
Ménière's disease in, 665
pathology, 665
periostitis in, 667
respiratory mucous membrane in, 665
saber deformity in, 666
skin changes in, 665
spleen in, 668
symptoms, 667
teeth in, 667
treatment, 668
viscera in, 666
Wassermann test for, 682
Syphilitic pseudoparalysis, 661
Syringe, antitoxin, 614
ear, 581, 583
Syringing ear, 584
Syringomyelocele, 484

Tabes mesenterica, 673
treatment, 674
Tache cérébrale in cerebrospinal meningitis, 540
Tænia elliptica, 249
saginata, 249
solium, 249
Takasu on blood in new-born, 389
Tannalbin in acute ileocolitis, 223
Tape-worm, 248
symptoms, 249
treatment, 249
Tardy hereditary syphilis, 665. See also *Syphilis, tardy hereditary.*
malnutrition of syphilitic origin, 669
treatment, 669, 670
Tartar emetic, 752
Taste of new-born infant, 44
Tay on amaurotic family idiocy, 489
Tay and Kingdon on cherry-red spot, 491

Teeth, 174
care of, 174
cavities in, 174
Hutchinson's, 667
loss of first, 174
permanent, 174
Teething cough, 271, 272
Temperature, 715
elevation of, active exercise in nervous children as cause, 718
encysted empyema as cause, 720
intestinal infection as cause, 720
obscure, 718
otitis as cause, 720
periodic fever as cause, 720
pyelitis as cause, 720
tuberculosis as cause, 720
typhoid fever as cause, 720
unexplained, 720
in acute retropharyngeal abscess, 277
in cerebrospinal meningitis, 539, 541
in diphtheria, 611
in influenza, 653
in intussusception, 232
in lobar pneumonia, 320
in measles, 603
in typhoid fever, 640
in varicella, 589
normal, 715
of exercise-room, 771
of room in acute illness, 146
Tenia, 248
Teniasis, 246
Test, Calmette's tuberculin, for tuberculosis, 681
complement fixation, for syphilis, 683
deviation, for syphilis, 683
Hamburger's tuberculin, for tuberculosis, 679
Moro's tuberculin, for tuberculosis, 680
Noguchi butyric-acid, for syphilis, 683
luetin, for syphilis, 684
ophthalmic tuberculin, for tuberculosis, 680
von Pirquet's tuberculin, for tuberculosis, 679
Wassermann, for syphilis, 682
Widal, for typhoid fever, 685
Wolff-Eisner's tuberculin, for tuberculosis, 680
Testicle, undescended, 448
inguinal hernia and, differentiation, 726
treatment of, 448
Testut on weight of thymus, 414
Tetanus antitoxin in tetanus neonatorum, 169
bacillus, 168
neonatorum, 168
incubation period, 168
pathology, 168
prognosis, 169
symptoms, 169
tetanus antitoxin in, 169
treatment, 169
Tetany, 474
age incidence, 474
bath in, 480
calcium metabolism and, relation, 476
Chvostek's sign in, 477
climate in, 480
diagnosis of, 478
duration of, 478
electric irritability in, 478
etiology of, 475
hand in, 477
muscle irritability in, 477
oil inunctions in, 480
pathology of, 477
prognosis of, 479
proteid diet in, 480
Schultz's sign in, 478
symptoms of, 477
tonics in, 480
treatment of, 479
Trousseau's sign in, 478
Therapeutic measures, 741
nihilism, 741
value of climate, 743
Thermometer, bath, 749
Thiemich on tetany, 476
Thirst-hunger in new-born infant, 44
Thomas' modified strait-jacket, 572, 573
Thompson on gymnastic therapeutics, 771
Thomson on Buhl's disease, 171
on pyloric stenosis, 193
Thoracic breathing, 781
Thread-worms, 247
rectal injections in, 248
symptoms, 247
treatment, 248
Thrill in diseases of heart, 367
Throat and nose, care of, in scarlet fever, 634
diseases of, 266
examination of, 270
irrigation of, 277
in tonsillitis, 281
indications, 277
technic, 278
sore, streptococcus, 279
Thrombosis, 496
sinus, 586
symptoms of, 586
treatment of, 586
Thrush, 176
Thumb-sucking, 463
Thymol in hook-worm, 250
poisoning, 250
Thymus gland, 413
anatomy of, 413
enlargement, as cause of convulsions, 469
functions of, 415
palpation of, 414
percussion of, 414
physiology of, 415
tuberculosis of, 360
weight and size, 414
in status lymphaticus, 414

Thyroid treatment of cretinism, 707–709
Tic, 505
  treatment of, 506
Tincture of muriate of iron, 753
Tinea circinata, 556. See also *Ring-worm.*
  tonsurans, 557. See also *Ring-worm of scalp.*
Tongue, geographic, 181
  ring-worm of, 181
  strawberry, in scarlet fever, 627
Tonics in habitual loss of appetite, 89
  in malnutrition in older children, 93
Tonsillar diphtheria, tonsillitis and, differentiation, 280
Tonsillitis, 279
  age incidence, 279
  chlorate of potash in, 282
  cold compress in, 282
  complications, 280
  diagnosis, differential, 280
  diphtheria and, differentiation, 611
  duration, 280
  etiology, 279
  follicular, acute, 279
  irrigation of throat in, 281
  pathology, 279
  predisposition, 279
  prognosis, 280
  symptoms, 280
  tonsillar diphtheria and, differentiation, 280
  treatment, 281
Tonsils, 278
  abdominal, 252
  and adenoids, radical removal, 296, 297
    adhesions after, 298
    benefits from, 298
  diseased, permanently, 294
    necessity for operative interference in, 295
  enlargement of, adenoids associated with, 294
    chronic, 294
  faucial, 278
  hypertrophy of, chronic, 294
  lingual, 279
  pharyngeal, 279
  tubal, 279
Top-milk feeding, 62
Touch of new-born infant, 44
Toxic convulsions, 469
Toxins, 764
Tracheal cough, 273
Transitional cells, 390
Transmissible diseases, 587
Traumatic eczema, treatment, 570
  laryngitis, 289
    treatment, 289
Traveling, milk for, 103
Treatment, 741
  of individual, 152
Treponema pallidum, 657
Trichenella spiralis, 250
Trichina spiralis, 250
Trichiniasis, 250
Trichiniasis, symptoms, 251
  treatment, 251
Trousseau's sign in tetany, 478
Truss, Hood, 726
Tubal tonsils, 279
Tub-bath, 748
  for fever, 749
  in scarlet fever, 633
Tubercle bacillus, 670
    avenues of entrance, 671
Tuberculin in diagnosis of tuberculosis, 679
      cutaneous inoculation, 679
      eye inoculation, 680
      subcutaneous inoculation, 679
  in treatment of tuberculosis, 769
  skin reactions in infancy, 681
  test, Calmette's, for tuberculosis, 681
    Hamburger's, for tuberculosis, 679
    Moro's, for tuberculosis, 680
    ophthalmic, for tuberculosis, 680
    von Pirquet's, for tuberculosis, 679
    Wolff-Eisner, for tuberculosis, 680
Tuberculosis, 670
  abdominal, 673
    treatment of, 674
  acute miliary, typhoid fever and, differentiation, 640
  as cause of elevation of temperature, 720
  avenues of entrance of bacillus, 671
  blood in, 393
  bovine, 670
    human tuberculosis and, Detrè's method of differentiation, 680
  carriers, 671
  climate in, 744
  from milk infection, 672
  heliotherapy in, 677
  in different sites, relative frequency, 672
  joint, diagnosis of, 728
  of cervical lymph-nodes, 410. See also *Adenitis, tuberculous.*
  of heart, 359
  of intestines, 359
  of kidney, 359, 426
    treatment, 426
  of larynx, 360
  of liver, 359
  of mesenteric gland, 673
    treatment, 674
  of pancreas, 360
  of peritoneum, 360
    chronic, 674. See also *Tuberculous peritonitis, chronic.*
  of spine, diagnosis, 728
  of spleen, 359
  of stomach, 359
  of thymus gland, 360
  predisposing causes, 671
  prophylaxis of, 672
  pulmonary, 357
    as cause of cough, 273
    associated lesions, 359
    bacilli in stool in, 359

Tuberculosis, pulmonary, care of sputum in, 362
chronic bronchitis and, differentiation, 311
climate in, 360
diagnosis of, 358
diet in, 360
empyema and, differentiation, 351
hygiene in, 361
method of obtaining sputum in, 358
pathology of, 357
prognosis of, 359
symptoms of, 357
tonics in, 361
treatment of, 360
sanitarium treatment, 744
surgical, heliotherapy in, 677
Rollier's treatment, 677
tuberculin in diagnosis of, 679
cutaneous inoculation, 679
eye inoculation, 680
subcutaneous inoculation, 679
in treatment of, 769
types of infection, 670
Tuberculous adenitis, 410. See also *Adenitis, tuberculous.*
caries of cervical vertebræ, 277
disease of hip, diagnosis, 729
meningitis, 532. See also *Meningitis, tuberculous.*
peritonitis, chronic, 674
age incidence, 675
ascitic type, 675
diagnosis of, 676
etiology of, 674
fibrous type, 675
heliotherapy in, 677
pathology of, 674
plastic type, 675
prognosis of, 676
symptoms of, 675
treatment of, 676
types of lesions, 675
pleurisy, 345
tumors of brain, 485
Tumors, intra-abdominal, as cause of intestinal obstruction, 245
of brain, 485
tuberculous, 485
of kidney, 426
treatment, 427
of spleen, 262
Tunica vaginalis, hydrocele of, 450
Tunnicliff on cancrum oris, 180
on injection of pseudodiphtheria bacilli in otitis media, 769
on opsonic index to streptococci in scarlet fever, 768
Tussis infantum, 593
perennis, 593
Tympanites in lobar pneumonia, 321
Tympanitic dulness of chest, 300
resonance of chest, 300
Typhoid bacillus, 637
dead, inoculations of, 768
carriers, 638
Typhoid fever, 637
acute miliary tuberculosis and, differentiation, 640
as cause of elevation of temperature, 720
bacteriology, 637
bathing in, 641
blood in, 393
complications, 640
control of fever, 645
diagnosis, 640
differential, 640
diarrhea in, treatment, 644
diet in, 641
drugs in, 644
feeding in, 641
gastro-intestinal symptoms, 639
heart stimulants in, 645
hydrotherapy in, 646
inoculations of dead typhoid bacilli as prophylactic against, 768
intestinal hemorrhage in, 640
treatment, 646
mortality, 641
mouth toilet in, 641
nervous symptoms, 639
pathology, 638
perforation in, 640
treatment, 646
pulse in, 639
rose spots in, 639
spleen in, 639
symptoms, 639
temperature in, 640
transmission, 639
treatment, 641
Widal reaction in, 638, 685
Typhus syncopalis, 536

Ulceration at angle of mouth, 182
of stomach, 190
treatment, 190
Ulcerative ileocolitis, 220
proctitis, 260
stomatitis, 177
Ulcus Egyptacum, 608
Syracum, 608
Umbilical cord, care of stump of, 43
hernia of, 724
treatment, 724
granuloma in newly born, 169
treatment, 170
hernia, congenital, 724
treatment of, 724
polyp in new-born infant, 167
Umbilicus, hernia at, 723
sepsis of, in new-born, 160
Uncinaria, 249
americana, 249
symptoms, 250
treatment, 250
Uncinariasis, 246, 249
Unclassified diseases, 687
Underwood's disease, 158
Undescended testicle, 448

Undescended testicle, inguinal hernia and, differentiation, 726
treatment, 448
Unpalatable drugs, 751
Uremia in acute diffuse nephritis, 431
treatment, 436
Uremic convulsions, 470
Urethra, atresia of, 455
treatment, 455
Urination, continence established, 418
difficult, 418
frequency of, 417
painful, 418
Urine, 417
amount passed, 417
blood in, 424
examination of, in acute diffuse nephritis, 432
illness, 147
in scarlet fever, 631
in acute diffuse nephritis, 431
in cholera infantum, 200
in diabetes mellitus, 712
incontinence of, 419. See also *Enuresis.*
method of collecting, 418
pus in, 424
retention of, 418
treatment, 419
specific gravity, 417
suppression of, 418
in acute illness, 148
treatment, 419
Urogenital system, 417
Urotropin in pyelocystitis, 442
Urticaria, 551
after use of diphtheria antitoxin, 615
distribution of, 551
etiology of, 551
giant, 551
treatment of, 552

Vaccination, 730
after-treatment of, 730
complications of, 731
constitutional disturbance in, 731
local applications in, 731
method of, 730
shield, 731
site of, 730
Vaccine, gonococcus, 768
in furunculosis, 555
meningococcus, 769
pneumococcus, 769
in empyema, 769
preparation of, 766
staphylococcus, 766
in acne, 767
in empyema, 767
in furunculosis, 767
in osteomyelitis, 767
in otitis media, 767
in septicemia, 767
in styes, 767
in suppuration, 767
Vaccine, streptococcus, 767
in adenitis, 768
in erysipelas, 768
in osteomyelitis, 768
in otitis media, 768
in scarlet fever, 768
treatment, 764
of erysipelas, 565
of gonorrheal vulvovaginitis, 454
of pyelocystitis, 443
of whooping-cough, 602
Vagina, atresia of, 455
treatment, 455
Vaginitis, simple, 452. See also *Vulvovaginitis, gonorrheal.*
Valvular disease, chronic, of heart, 383
constructive medication in, 386
diagnosis, 384
digitalis in, 387
drugs in, 385
etiology, 383
heart rest in, 386
stimulants in, 387
prognosis, 384
strophanthus in, 387
symptoms, 384
treatment, 385
Vapo-cresolene in whooping-cough, 597
Vapor in influenza, 656
in measles, 607
Vaquez and Quiserne on polycythemia in congenital heart disease, 396
Varicella, 588
complications of, 590
duration of, 590
incubation period, 589
prognosis of, 590
quarantine in, 590
rash in, 589
symptoms of, 589
temperature in, 589
treatment of, 590
Venous murmurs, 367
Ventilation for new-born infant, 19
in acute illness, 146
of nursery, 38
Ventral hernia, 727
Vermiform appendix, anatomy, 251
Vertebræ, cervical, tuberculous caries of, 277
Vesical calculus, 444
Vesicular breathing, 301
distant, 301
exaggerated, 301, 302
Virchow on cretinism, 705
on necrobiosis, 178
on nevus, 577
Virus of acute poliomyelitis, 517
Viscera in tardy hereditary syphilis, 666
Vocal fremitus in lobar pneumonia, 323
Voegtlin on tetany, 477
Vomiting, 218
cyclic, 691. See also *Cyclic vomiting.*
due to too strong food, 65
etiology of, 218
causes remote from stomach, 218

Vomiting, habitual, lavage of stomach in, 191
management of, 190
hysteric, 461
in dilatation of stomach, 218
in icterus, 264
in lobar pneumonia, 321
in pyloric stenosis, 194, 218
obstinate, gavage in, 759
of blood, 189
periodic, 691. See also *Cyclic vomiting.*
persistent, in acute gastric indigestion, 185
treatment, 187
recurrent, 691. See also *Cyclic vomiting.*
von Eiselsberg on thyroid grafting in cretinism, 704
von Hecker and Buhl on hemorrhagic disease of newly born, 170, 171
von Jaksch on starch digestion, 78
pseudoleukemic anemia of, 400
von Pirquet and Schick on serum disease, 685
von Pirquet's tuberculin test for tuberculosis, 679
Vulvovaginitis, gonorrheal, 452
age incidence, 452
complications of, 453
diagnosis of, 453
etiology of, 452
prophylaxis of, 453
symptoms of, 452
treatment of, 453
vaccine treatment, 454
simple, 451
diagnosis of, 451
etiology of, 451
prognosis of, 451
symptoms of, 451
treatment of, 451

Waddling gait in pseudomuscular hypertrophy, 511
Walbach on pyloric stenosis, 194
Walking movements for bad posture, 779
up and down stairs in congenital ataxias, 807
Washing mouth in stomatitis, 179
stomach-. See *Lavage.*
Wassermann test for syphilis, 682
Wasting palsy, 507
Water drinking in acute illness, 146
to drink in summer, 733
Water-pressure, reduction of intussusception by, 233
Watt on pertussis, 593
Weaning, care of breasts during, 30
Weather, hot, changes in feeding in, 69
Weaver on cancrum oris, 180
on scarlet fever, 624
Webber on cerebrospinal meningitis, 536
Wedel on diphtheria, 608
Weighing infants, 136
Weighing infants, frequency, 40
scales for, 42
Weight chart, 41
loss in, in pyloric stenosis, 194
of new-born infant, 40
Weisner and Leiner on acute poliomyelitis, 517
Welch's method of treatment of hemorrhagic diseases of newly born, 173
Werdnig on progressive amyotrophy, 507
West on tetany, 476
Wet-brain in cholera infantum, 200
Wet-nurse, 34
in cholera infantum, 204
in marasmus, 83
selection of, 34
Wheat jelly, formula for making, 104
Whey, formula for making, 105
in difficult feeding, 113
in marasmus, 86
Whey-feeding, 72
Whistler on rickets, 127
Whooping-cough, 593
alum in, 597
antipyrin in, 598, 599
as cause of cough, 273
bacteriology of, 593
belladonna in, 598
blood in, 394
bromids in, 598, 599
bromoform in, 597
climate in, 743
cocain in, 597
codein in, 599
complications of, 595
diagnosis of, 595
differential, 596
drugs in, 597
fluidextract of horse-chestnut leaves in, 597
fresh air in, 600
history of, 593
incubation period, 595
infective period, 594
interrupted medication in, 599
Kilmer belt in, 600
pathology of, 594
prognosis of, 596
quinin in, 598
steam inhalations in, 597, 600
susceptibility to, 594
symptoms of, 595
transmission of, 594
treatment of, 596
vaccine treatment, 602
vapo-cresolene in, 597
Wickman on acute poliomyelitis, 519, 520, 521
Widal on salt-free diet in nephritis, 433
reaction in typhoid fever, 638, 685
Wilcox on tetany, 475, 478
Wile on eosinophilia in asthma, 394
Willcox on pyloric stenosis, 193
Williams on scarlet fever, 624
Winckel on Buhl's disease, 170
Winckel's disease, 171

Window-board, 150
Wolff-Eisner tuberculin test for tuberculosis, 680
Wollstein on influenza, 651
on pertussis, 594
on tuberculosis, 672
Work and stress as factors in nutrition and growth of new-born infant, 20
Worms, hook-, 249
symptoms of, 250
treatment of, 250
pin-, 247
rectal injections in, 248
symptoms of, 247
treatment of, 248
round-, 246
symptoms of, 247
treatment of, 247
tape-, 248
symptoms of, 249
treatment of, 249
Worms, thread-, 247
rectal injections in, 248
symptoms of, 247
treatment of, 248
Wright on method of obtaining blood-serum, 765
on opsonic index as guide to dosage of tuberculin, 769
on scurvy, 124
Wright and Douglas on opsonins, 765
Written directions in acute illness, 150, 151
Wyeth on aspiration of renal tumor, 429
on treatment of hypospadias, 450

Yellow atrophy, acute, of liver, 263
Yersin on diphtheria, 609

Zweifel and Korwin on pancreatic extract, 79

SAUNDERS' BOOKS

on

SURGERY

and

ANATOMY

W. B. SAUNDERS COMPANY

WEST WASHINGTON SQUARE PHILADELPHIA
9, HENRIETTA STREET COVENT GARDEN, LONDON

Bryan's Principles of Surgery

Principles of Surgery. By W. A. Bryan, M. D., Professor of Surgery and Clinical Surgery at Vanderbilt University, Nashville. Octavo of 677 pages, with 224 original illustrations. Cloth, $4.00 net.

JUST ISSUED

Dr. Bryan here gives you facts, accurately and concisely stated, without which no modern practitioner can do modern work. He discredits many fallacious ideas, giving you *facts* instead. He shows you in a most practical way the relations between surgical pathology and the resultant symptomatology, and points out the influence such information has on *treatment*.

While the title of the work is "Principles of Surgery," it really covers elemental teachings vitally concerned with *every branch of medical practice*. The subject of *tumors* covers nearly 200 pages. Dr. Bryan here discredits the idea that malignant growths are almost always painful. This belief has delayed the diagnosis in many cases and caused much harm. *Vaccine therapy* is discussed; *grafting of skin, bone, tendons, nerves*, etc., is clearly presented, giving you many valuable aids to perfect technic—all illustrated with instructive pictures.

Dr. A. Vander Veer, *Albany Medical College.*

"It comes to us full of new ideas. So much that is clear and concise has been added that t is fascinating to study the work. It is bound to receive a hearty welcome."

The New Keen's Surgery

Surgery: Its Principles and Practice. Written by 81 eminent specialists. Edited by W. W. Keen, M. D., LL.D., Hon. F.R.C.S., Eng. and Edin., Emeritus Professor of the Principles of Surgery and of Clinical Surgery at the Jefferson Medical College. Six octavos of 1050 pages each, containing 3100 original illustrations, 157 in colors. Per volume: Cloth, $7.00 net; Half Morocco, $8.00 net.

VOLUME VI GIVES YOU THE NEWEST SURGERY

ALL THE ADVANTAGES OF A REVISION AT ONE-FIFTH THE COST

We have issued a Volume VI of "Keen"—the volume of the newest surgery. In this way you get all the advantages of a complete and thorough revision at but *one-fifth the cost.* It makes Keen's Surgery the best, the most up-to-date surgery on the market.

In this sixth volume you get the newest surgery—both general and special—from the pens of those same international authorities who have made the success of Keen's Surgery world-wide. Each man has searched for the new, the *really useful,* in his particular field, and he gives it to you here. Here you get the newest surgery, and fully illustrated. Then, further, you get a *complete index* to the entire six volumes, covering 125 pages, but so arranged that reference to it is extremely easy. If you want the newest surgery, you must turn to the new "Keen" for it.

SOME OF THE NEW MATTER IN VOLUME VI

Vaccine serum, opsonic index, etc.
Antiferment and trypsin treatments
Beck's bismuth paste
Postoperative and catgut tetanus
Murphy's formalin-glycerin injections
W. L. Clark's desiccation method
DeKeating-Hart fulguration
Anoci-association (its *practical* use)
New extension treatments for fractures
Lane's bone-plates
Differential pressure cabinets
Carbon-dioxid snow
Laminectomy
Bone-grafting and transplantation
Nitrous oxid, intratracheal and intravenous anesthesia
Pituitary surgery
Kocher's horizontal ("normal") incision
Thyroid and parathyroid surgery
Tracheal grafts
Pulmonary emphysema
Ochsner's peritonitis treatment
Jejunal and gastrojejunal ulcers
Lane's kink
Murphy's five diagnostic methods
Subphrenic abscess
Unilateral suppurative nephritis
New gynecologic operations (90 pages)

Hornsby and Schmidt's The Modern Hospital

The Modern Hospital. Its Inspiration; Its Construction; Its Equipment; Its Mangement. By JOHN A. HORNSBY, M. D., Secretary, Hospital Section, American Medical Association; and RICHARD E. SCHMIDT, Architect. Large octavo of 644 pages, with 207 illustrations. Cloth, $7.00 net; Half Morocco, $8.50 net.

HOSPITAL EFFICIENCY

"Hornsby and Schmidt" tells you just exactly how to plan, construct, equip, and manage a hospital in all its departments, giving you every detail. It gives you exact data regarding heating, ventilating, plumbing, refrigerating, etc.—*and the costs.* It tells you how to equip a modern hospital with modern appliances. It tells you what you need in the operating room, the wards, the private rooms, the dining room, the kitchen—every division of hospital housekeeping. It gives you the duties of the directors, the superintendent, the various staffs, their relations to each other. It tells you all about nurses' training-schools—their management, curriculum, rules, regulations, etc. It gives you definite diets for the patients and the hospital household. It gives you hundreds of valuable points on the business management of hospitals—large and small. In fact, it tells you how to plan, construct, equip, and maintain a hospital with the greatest economy compatible with the highest efficiency.

Campbell's Surgical Anatomy

A Text-Book of Surgical Anatomy. By WILLIAM FRANCIS CAMPBELL, M. D., Professor of Anatomy, Long Island College Hospital. Octavo of 675 pages, with 319 original illustrations. Cloth, $5.00 net; Half Morocco, $6.50 net.

THE NEW (2d) EDITION

The first aim in the preparation of this original work was to emphasize the practical. It is in the fullest sense an applied anatomy—an anatomy that will be of inestimable value to the surgeon because only those facts are discussed and only those structures and regions emphasized that have a peculiar interest to him. Dr. Campbell has treated his subject in a very systematic way. The magnificent original illustrations will be found extremely practical.

Boston Medical and Surgical Journal

"The author has an excellent command of his subject, and treats it with the freedom and the conviction of the experienced anatomist. He is also an admirable clinician."

Cotton's
Dislocations and Joint Fractures

Dislocations and Joint Fractures. By FREDERIC JAY COTTON, M. D., First Assistant Surgeon to the Boston City Hospital. Octavo of 654 pages, with 1201 original illustrations. Cloth, $6.00 net; Half Morocco, $7.50 net.

TWO PRINTINGS IN EIGHT MONTHS

Dr. Cotton's clinical and teaching experience in this field has especially fitted him to write a practical work on this subject. He has written a book clear and definite in style, systematic in presentation, and accurate in statement. The illustrations possess the feature of showing just those points the author wishes to emphasize. This is made possible because the author is himself the artist.

Boston Medical and Surgical Journal

"The work is delightful, spirited, scholarly, and original, and is not only a book of reference, but a book for casual reading. It brings the subject up to date, a feat long neglected."

Murphy's Famous Clinics

Surgical Clinics of John B. Murphy, M. D., at Mercy Hospital, Chicago. Issued serially, one number every other month (six numbers a year). Each issue about 150 octavo pages, illustrated. Per year: $8.00; Cloth, $12.00. Sold only by the year.

DOWN-TO-THE-MINUTE SURGERY

This is just the work you have been waiting for—a permanent record of the teachings of this great surgeon. These are *not* students' clinics, but delivered at Mercy Hospital, Chicago, *for physicians only*. They are *postgraduate clinics*. These CLINICS are published *just as delivered* by Dr. Murphy, an expert stenographer taking down everything Dr. Murphy says and does. In this way these CLINICS retain all that individual force and charm so characteristic of the clinical teaching of this distinguished surgeon. But the most vital point about *these* CLINICS is that they are *absolutely fresh*. They are surgery—practical, *applied* surgery—right down to the minute, published practically as soon as delivered. There is no stale matter. Everything is *new, never having appeared in print before*. It is all *live* clinical material.

Crandon and Ehrenfried's Surgical After-treatment

Surgical After-treatment. A Manual of the Conduct of Surgical Convalescence. By L. R. G. CRANDON, M. D., Assistant in Surgery, and ALBERT EHRENFRIED, M. D., Assistant in Anatomy, Harvard Medical School. Octavo of 831 pages, with 265 original illustrations. Cloth, $6.00 net; Half Morocco, $7.50 net.

THE NEW (2d) EDITION, PRACTICALLY REWRITTEN

This work tells how best to manage all problems and emergencies of surgical convalescence from recovery-room to discharge. It gives *all the details* completely, definitely, yet concisely, and does not refer the reader to some other work perhaps not then available. The post-operative conduct of all operations is given, arranged alphabetically by regions. A special feature is the elaborate chapter on *Vaccine Therapy, Immunization by Inoculation and Specific Sera,* by Dr. George P. Sanborn, a disciple of Sir A. E. Wright. The text is illustrated.

The Therapeutic Gazette

"The book is one which can be read with much profit by the active surgeon and will be generally commended by him."

Papers from the Mayo Clinic

Collected Papers by the Staff of St. Mary's Hospital, Mayo Clinic. By WILLIAM J. MAYO, M. D., CHARLES H. MAYO, M. D., and their ASSOCIATES at St. Mary's Hospital, Rochester, Minn. Papers of 1905–1909, Papers of 1910, Papers of 1911, Papers of 1912. Each an octavo of about 600 pages, well illustrated. Per volume: Cloth, $5.50 net.

PAPERS OF 1912 NOW READY

Many of these papers have been read before medical societies and all of them have been published in current medical literature. The chief reason for bringing them together in the present form is for convenience of reference. The original plan was to have the papers printed for private distribution only, but at the instance of numerous members of the medical profession, the authors have consented to having the book placed on the market. The text is profusely illustrated with original illustrations.

Bulletin Medical and Chirurgical Faculty of Maryland

"Much of the work done at the Mayo Clinic and recorded in these papers has been epoch-making in character. * * * Represents a most substantial block of modern surgical progress."

A Collection of Papers (published previous to 1909). By WILLIAM J. MAYO, M. D., and CHARLES H. MAYO, M. D. Two octavos of 525 pages each, illustrated. Per set: Cloth, $10.00 net.

Mumford's Practice of Surgery

The Practice of Surgery. By JAMES G. MUMFORD, M. D., Instructor in Surgery, Harvard Medical School. Octavo of 1015 pages, with 682 illustrations. Cloth, $7.00 net; Half Morocco, $8.50 net.

DIFFERENT FROM OTHER SURGERIES

This, as its title implies, is a work on the *clinical* side of surgery—surgery as it is seen at the bedside, in the accident ward, and in the operating room. It expresses the matured outgrowth of twenty years of active hospital and private surgical practice, together with the experience gained from clinical teaching, classroom discussions, and lectures.

John B. Murphy, M.D., *Professor of Surgery, Northwestern Medical School, Chicago.*

"This work truly represents Dr. Mumford's intellectual capacity and scope, and presents in a terse, forceful, yet pleasing manner, the live surgical topics of the day. It is in every particular up to date, and shows that rare quality of accentuating the essential and omitting the unnecessary."

DaCosta's Modern Surgery

Modern Surgery—GENERAL AND OPERATIVE. By JOHN CHALMERS DACOSTA, M. D., Samuel D. Gross Professor of Surgery, Jefferson Medical College, Philadelphia. Octavo of 1525 pages, with 1085 illustrations.

JUST READY—NEW (7th) EDITION

A surgery, to be of the maximum value, must be up to date, must be complete, must have behind its statements the sure authority of experience, must be so arranged that it can be consulted quickly; in a word, it must be practical and dependable. Such a surgery is DaCosta's. Always an excellent work, for this edition it has been very materially improved by the addition of new matter to the extent of over 200 pages and by a most thorough revision of the old matter. Many old cuts have been replaced by new ones, and nearly 150 additional illustrations have been added. Notwithstanding this large addition of matter, the *price has not been increased.*

Rudolph Matas, M. D., *Professor of Surgery, Tulane University of Louisiana.*

"This edition is destined to rank as high as its predecessors, which have placed the learned author in the fore of text-book writers. The more I scrutinize its pages the more I admire the marvelous capacity of the author to compress so much knowledge in so small a space."

Scudder's Treatment of Fractures

WITH NOTES ON DISLOCATIONS

The Treatment of Fractures: with Notes on a few Common Dislocations. By CHARLES L. SCUDDER, M. D., Surgeon to the Massachusetts General Hospital, Boston. Octavo of 708 pages, with 994 original illustrations. Polished Buckram, $6.00 net; Half Morocco, $7.50 net.

THE NEW (7th) EDITION, ENLARGED
OVER 33,500 COPIES

The fact that this work has attained a seventh edition indicates its practical value. In this edition Dr. Scudder has made numerous additions throughout the text, and has added many new illustrations, greatly enhancing the value of the work. In every way this new edition reflects the very latest advances in the treatment of fractures.

J. F. Binnie, M.D., University of Kansas

"Scudder's Fractures is the most successful book on the subject that has ever been published. I keep it at hand regularly."

Scudder's Tumors of the Jaws

Tumors of the Jaws. By CHARLES L. SCUDDER, M. D., Surgeon to the Massachusetts General Hospital, Boston. Octavo of 395 pages, with 353 illustrations, 6 in colors. Cloth, $6.00 net; Half Morocco, $7.50 net.

WITH NEW ILLUSTRATIONS

Dr. Scudder in this book tells you how to determine in each case the *form* of new growth present and then points out the best treatment. As the tendency of malignant disease of the jaws is to grow into the accessory sinuses and toward the base of the skull, an intimate knowledge of the anatomy of these sinuses is essential. Dr. Scudder has included, therefore, sufficient anatomy and a number of illustrations of an anatomic nature. Whether general practitioner or surgeon, you need this new book because it gives you just the information you want.

Sisson's Veterinary Anatomy

Text-Book of Veterinary Anatomy. By SEPTIMUS SISSON, S. B., V. S., Professor of Comparative Anatomy in Ohio State University. Octavo volume of 826 pages, with 588 illustrations, mostly original and many in colors. Cloth, $7.00 net; Half Morocco, $8.50 net.

WITH SUPERB ILLUSTRATIONS

This is a clear and concise statement of the essential facts regarding the structure of the principal domesticated animals, containing many hitherto unpublished data resulting from the detailed study of formalin-hardened subjects and frozen sections. Nearly all of the illustrations are original, the majority being reproduced from photographs, and colors frequently used. The terminology has been carefully revised with reference to the B. N. A. and the nomenclature adopted by European comparative anatomists.

Boston Medical and Surgical Journal

"It is not amiss to say that the work ranks with the best. A marked advance in English veterinary literature, upon which student and practitioner may well congratulate themselves and no medical school can afford to be without. It is an exhaustive gross anatomy of the horse, ox, pig, and dog, including the splanchnology of the sheep."

Gant on Constipation and Intestinal Obstruction

Constipation and Intestinal Obstruction. By SAMUEL G. GANT, M. D., Professor of Diseases of the Rectum and Anus, New York Post-Graduate Medical School and Hospital. Octavo of 559 pages, with 250 original illustrations. Cloth, $6.00 net; Half Morocco, $7.50 net.

INCLUDING RECTUM AND ANUS

In this work the consideration given to the medical treatment of constipation is unusually extensive. The practitioner will find of great assistance the chapter devoted to formulas. The descriptions of the operative procedures are concise, yet fully explicit.

The Proctologist

"Were the profession better posted on the contents of this book there would be less suffering from the ill effects of constipation. We congratulate the author on this most complete book."

Kelly & Noble's Gynecology and Abdominal Surgery

Gynecology and Abdominal Surgery. Edited by HOWARD A. KELLY, M.D., Professor of Gynecology in Johns Hopkins University; and CHARLES P. NOBLE, M.D., formerly Clinical Professor of Gynecology in the Woman's Medical College, Philadelphia. Two imperial octavo volumes of 950 pages each, containing 880 original illustrations, some in colors. Per volume: Cloth, $8.00 net; Half Morocco, $9.50 net.

WITH 880 ILLUSTRATIONS—TRANSLATED INTO SPANISH

This work possesses a number of valuable features not to be found in any other publication covering the same fields. It contains a chapter upon the bacteriology and one upon the pathology of gynecology, and a large chapter devoted entirely to *medical gynecology*, written especially for the physician engaged in general practice. *Abdominal surgery* proper, as distinct from gynecology, is fully treated, embracing operations upon the stomach, intestines, liver, bile-ducts, pancreas, spleen, kidneys, ureter, bladder, and peritoneum.

American Journal of Medical Sciences

"It is needless to say that the work has been thoroughly done; the names of the authors and editors would guarantee this, but much may be said in praise of the method of presentation, and attention may be called to the inclusion of matter not to be found elsewhere."

Bickham's Operative Surgery

A Text-Book of Operative Surgery. By WARREN STONE BICKHAM, M.D., of New York. Octavo of 1200 pages, with 854 original illustrations. Cloth, $6.50 net; Half Morocco, $8.00 net.

THE NEW (3d) EDITION

This work completely covers the surgical anatomy and operative technic involved in the operations of general surgery. The practicability of the work is particularly emphasized in the 854 magnificent illustrations.

Boston Medical and Surgical Journal

"The book is a valuable contribution to the literature of operative surgery. It represents a vast amount of careful work and technical knowledge on the part of the author. For the surgeon in active practice or the instructor of surgery it is an unusually good review of the subject."

Eisendrath's Surgical Diagnosis

A Text-Book of Surgical Diagnosis. By DANIEL N. EISENDRATH, M.D., Professor of Surgery in the College of Physicians and Surgeons, Chicago. Octavo of 885 pages, with 574 entirely new and original text-illustrations and some colored plates. Cloth, $6.50 net; Half Morocco, $8.00 net.

THE NEW (2d) EDITION

Of first importance in every surgical condition is a correct diagnosis, for upon this depends the treatment to be pursued; and the two—diagnosis and treatment—constitute the most practical part of practical surgery. Dr. Eisendrath takes up each disease and injury amenable to surgical treatment, and sets forth the means of correct diagnosis in a systematic and comprehensive way. Definite directions as to methods of examination are presented clearly and concisely, providing for all contingencies that might arise in any given case. Each illustration indicates precisely how to diagnose the condition considered.

Surgery, Gynecology, and Obstetrics

"The book is one which is well adapted to the uses of the practising surgeon who desires information concisely and accurately given. . . . Nothing of diagnostic importance is omitted, yet the author does not run into endless detail."

Eisendrath's Clinical Anatomy

A Text-Book of Clinical Anatomy. By DANIEL N. EISENDRATH, A.B., M.D., Professor of Surgery in the College of Physicians and Surgeons, Chicago. Octavo of 535 pages, illustrated. Cloth, $5.00 net; Half Morocco, $6.50 net.

THE NEW (2d) EDITION

This new anatomy discusses the subject from the clinical standpoint. A portion of each chapter is devoted to the examination of the living through palpation and marking of surface outlines of landmarks, vessels, nerves, thoracic and abdominal viscera. The illustrations are from new and original drawings and photographs. This edition has been carefully revised.

Medical Record, New York

"A special recommendation for the figures is that they are mostly original and were made for the purpose in view. The sections of joints and trunks are those of formalinized cadavers and are unimpeachable in accuracy."

Fenger Memorial Volumes

Fenger Memorial Volumes. Edited by LUDVIG HEKTOEN, M. D., Professor of Pathology, Rush Medical College, Chicago. Two octavos of 525 pages each. Per set: Cloth, $15.00 net; Half Morocco, $18.00 net.

LIMITED EDITION

These handsome volumes consist of all the important papers written by the late Christian Fenger, for many years professor of surgery at Rush Medical College, Chicago. Not only the papers published in English are included, but also those which originally appeared in Danish, German, and French.

The name of Christian Fenger typifies thoroughness, extreme care, deep research, and sound judgment. His contributions to the advancement of the world's surgical knowledge are indeed as valuable and interesting reading to-day as at the time of their original publication. They are pregnant with suggestions. Fenger's literary prolificacy may be judged from this memorial volume—over 1000 pages.

Sobotta *and* McMurrich's Human Anatomy

Atlas and Text-Book of Human Anatomy. In Three Volumes. By J. SOBOTTA, M.D., of Würzburg. Edited, with additions, by J. PLAYFAIR MCMURRICH, A. M., PH. D., Professor of Anatomy, University of Toronto, Canada. Three large quartos, each containing about 250 pages of text and over 300 illustrations, mostly in colors. Per volume: Cloth, $6.00 net; Half Morocco, $7.50 net.

VOLUME III NOW READY—COMPLETING THE WORK

The great advantage of this over other similar works lies in the large number of magnificent lithographic plates which it contains, without question the best that have ever been produced in this field. They are accurate and beautiful reproductions of the various anatomic parts represented.

Edward Martin, M.D., *Professor of Clinical Surgery, University of Pennsylvania.*

"This is a piece of bookmaking which is truly admirable, with plates and text so well chosen and so clear that the work is most useful to the practising surgeon."

Morris' Dawn of the Fourth Era in Surgery

DAWN OF THE FOURTH ERA IN SURGERY AND OTHER ARTICLES. By ROBERT T. MORRIS, M. D., Professor of Surgery, New York Post-Graduate Medical School and Hospital. 12mo of 145 pages, illustrated. $1.25 net.

Moynihan's Duodenal Ulcer

Duodenal Ulcer. By B. G. A. MOYNIHAN, M.S. (LONDON), F.R.C.S., Leeds, England. Octavo of 486 pages, illustrated. Cloth, $5.00 net; Half Morocco, $6.50 net.

THE NEW (2d) EDITION

For this edition the work has been entirely reset and brought up to date. All the cases operated upon since the appearance of the first edition have been included and a new chapter added on Jejunal and Gastro-jejunal Ulcers.

Moynihan's Abdominal Operations

Abdominal Operations. By B. G. A. MOYNIHAN, M.S. (LONDON), F. R. C. S., Leeds, England. Octavo, beautifully illustrated.

THE NEW (3d) EDITION—PREPARING

Edward Martin, M. D., *University of Pennsylvania.*

"It is a wonderfully good book. He has achieved complete success in illustrating, both by words and pictures, the best technic of the abdominal operations now commonly performed."

Moynihan on Gall-stones

Gall-Stones and Their Surgical Treatment.—By B. G. A. MOYNIHAN, M. S. (LONDON), F. R. C. S., Leeds, England. Octavo of 458 pages, illustrated. Cloth, $5.00 net; Half Morocco, $6.50 net.

THE NEW (2d) EDITION

Mr. Moynihan, in revising his book, has made many additions to the text, so as to include the most recent advances. Especial attention has been given to a detailed description of the early symptoms in cholelithiasis, enabling a diagnosis to be made in the stage in which surgical treatment can be most safely adopted.

British Medical Journal

"He expresses his views with admirable clearness, and he supports them by a large number of clinical examples, which will be much prized by those who know the difficult problems and tasks which gall-stone surgery not infrequently presents."

Dannreuther's Minor and Emergency Surgery

Minor and Emergency Surgery. By WALTER T. DANNREUTHER, M.D., Surgeon to St. Elizabeth's Hospital and to St. Bartholomew's Clinic, New York City. 12mo of 225 pages, illustrated. Cloth, $1.25 net.

ILLUSTRATED

Dr. Dannreuther emphasizes just those points most necessary in emergency work, giving numerous hints and suggestions that cannot help but be of great value to you in emergency work and in minor operations.

Schultze and Stewart's Topographic Anatomy

Atlas and Text-Book of Topographic and Applied Anatomy. By PROF. DR. O. SCHULTZE, of Würzburg. Edited, with additions, by GEORGE D. STEWART, M. D., Professor of Anatomy and Clinical Surgery, University and Bellevue Hospital Medical College, N. Y. Large quarto of 189 pages, with 25 colored figures on 22 colored lithographic plates, and 89 text-cuts, 60 in colors. Cloth, $5.50 net.

Griffith's Hand-Book of Surgery

A Manual of Surgery. By FREDERIC R. GRIFFITH, M. D., Surgeon to the Bellevue Dispensary, New York City. 12mo of 579 pages, with 417 illustrations. Flexible leather, $2.00 net.

Keen's Addresses and Other Papers

Addresses and Other Papers. Delivered by WILLIAM W. KEEN, M. D., LL.D., F. R. C. S. (Hon.), Professor of the Principles of Surgery and of Clinical Surgery, Jefferson Medical College, Philadelphia. Octavo volume of 441 pages, illustrated. Cloth, $3.75 net.

Keen on the Surgery of Typhoid

The Surgical Complications and Sequels of Typhoid Fever. By WM. W. KEEN, M.D., LL.D., F.R.C.S. (Hon.), Professor of the Principles of Surgery and of Clinical Surgery, Jefferson Medical College, Philadelphia, etc. Octavo volume of 386 pages, illustrated. Cloth, $3.00 net.

Gould's Operations on Intestines and Stomach

The Technic of Operations Upon the Intestines and Stomach. By ALFRED H. GOULD, M. D., of Boston. Large octavo, with 190 original illustrations, some in colors. Cloth, $5.00 net; Half Morocco, $6.50 net.

Bier's Hyperemia

Second Edition

Bier's Hyperemic Treatment in Surgery, Medicine, and the Specialties: A Manual of its Practical Application. By WILLY MEYER, M. D., Professor of Surgery at the New York Post-Graduate Medical School and Hospital; and PROF. DR. VICTOR SCHMIEDEN, Assistant to Prof. Bier, University of Berlin, Germany. Octavo of 280 pages, with original illustrations. Cloth, $3.00 net.

"We commend this work to all those who are interested in the treatment of infections, either acute or chonic, for it is the only authoritative treatise we have in the English language."—*New York State Journal of Medicine.*

Haynes' Anatomy

A Manual of Anatomy. By IRVING S. HAYNES, M.D., Professor of Practical Anatomy, Cornell University Medical College. Octavo, 680 pages, with 42 diagrams and 134 full-page half-tones. Cloth, $2.50 net.

American Pocket Dictionary

New (8th Edition

The American Pocket Medical Dictionary. Edited by W. A. NEWMAN DORLAND, A. M., M. D., Editor "American Illustrated Medical Dictionary." 677 pages. Full leather, limp, with gold edges, $1.00 net; with patent thumb index, $1.25 net.

McClellan's Art Anatomy

Anatomy in its Relation to Art. By GEORGE MCCLELLAN, M. D., Professor of Anatomy, Pennsylvania Academy of the Fine Arts. Quarto volume, 9 by 12½ inches, with 338 original drawings and photographs, and 260 pages of text. Dark blue vellum, $10.00 net; Half Russia, $12.50 net.

Fowler's Surgery

In Two Volumes

A Treatise on Surgery. By GEORGE R. FOWLER, M. D., Emeritus Professor of Surgery, New York Polyclinic. Two imperial octavos of 725 pages each, with 888 original text-illustrations and 4 colored plates. Per set: Cloth, $15.00 net; Half Morocco, $18.00 net.

International Text-Book of Surgery

Second Edition

The International Text-Book of Surgery. In two volumes. By American and British authors. Edited by J. COLLINS WARREN, M. D., LL. D., F. R. C. S. (Hon.), Professor of Surgery, Harvard Medical School; and A. PEARCE GOULD, M. S., F. R. C. S., of London, England. Vol. I.: *General and Operative Surgery.* Royal octavo, 975 pages, 461 illustrations, 9 full-page colored plates. Vol. II.: *Special or Regional Surgery.* Royal octavo, 1122 pages, 499 illustrations, and 8 full-page colored plates. Per volume: Cloth, $5.00 net; Half Morocco, $6.50 net.

American Text-Book of Surgery

Fourth Edition

American Text-Book of Surgery. Edited by W. W. KEEN, M. D., LL. D., HON. F. R. C. S., ENG. and EDIN., and J. WILLIAM WHITE, M. D., PH. D. Octavo, 1363 pages, 551 text-cuts and 39 colored and half-tone plates. Cloth, $7.00 net; Half Morocco, $8.50 net.

Robson and Cammidge on the Pancreas

The Pancreas: Its Surgery and Pathology. By A. W. MAYO ROBSON, F. R. C. S., of London, England; and P. J. CAMMIDGE, F. R. C. S., of London, England. Octavo of 546 pages, illustrated. Cloth, $5.00 net; Half Morocco, $6.50 net.

American Illustrated Dictionary

The New (7th) Edition

The American Illustrated Medical Dictionary. With tables of Arteries, Muscles, Nerves, Veins, etc.; of Bacilli, Bacteria, etc.; Eponymic Tables of Diseases, Operations, Stains, Tests, etc. By W. A. NEWMAN DORLAND, M.D. Large octavo, 1107 pages. Flexible leather, $4.50 net; with thumb index, $5.00 net.

Howard A. Kelly, M.D., *Professor of Gynecology, Johns Hopkins University, Baltimore.*

"Dr. Dorland's dictionary is admirable. It is so well gotten up and of such convenient size. No errors have been found in my use of it."

Golebiewski and Bailey's Accident Diseases

Atlas and Epitome of Diseases Caused by Accidents. By DR. ED. GOLEBIEWSKI, of Berlin. Edited, with additions, by PEARCE BAILEY, M.D. Consulting Neurologist to St. Luke's Hospital, New York City. With 71 colored figures on 40 plates, 143 text-cuts, and 549 pages of text. Cloth, $4.00 net. *In Saunders' Hand-Atlas Series.*

Helferich and Bloodgood on Fractures

Atlas and Epitome of Traumatic Fractures and Dislocations By PROF. DR. H. HELFERICH, of Greifswald, Prussia. Edited, with additions, by JOSEPH C. BLOODGOOD, M. D., Associate in Surgery, Johns Hopkins University, Baltimore. 216 colored figures on 64 lithographic plates, 190 text-cuts, and 353 pages of text. Cloth, $3.00 net. *In Saunders' Atlas Series.*

Sultan and Coley on Abdominal Hernias

Atlas and Epitome of Abdominal Hernias. By PR. DR. G. SULTAN, of Gottingen. Edited, with additions, by WM. B. COLEY, M. D., Clinical Lecturer and Instructor in Surgery, Columbia University, New York. 119 illustrations, 36 in colors, and 277 pages of text. Cloth, $3.00 net. *In Saunders' Hand-Atlas Series.*

Warren's Surgical Pathology

Second Edition

Surgical Pathology and Therapeutics. By J. COLLINS WARREN, M.D., LL.D., F.R.C.S. (HON.), Professor of Surgery, Harvard Medical School. Octavo, 873 pages; 136 illustrations, 33 in colors. Cloth, $5.00 net; Half Morocco, $6.50 net.

Zuckerkandl and DaCosta's Surgery

Second Edition

Atlas and Epitome of Operative Surgery. By DR. O. ZUCKERKANDL, of Vienna. Edited, with additions, by J. CHALMERS DACOSTA, M.D., Samuel D. Gross Professor of Surgery, Jefferson Medical College, Philadelphia. 40 colored plates, 278 text-cuts, and 410 pages of text. Cloth, $3.50 net. *In Saunders' Atlas Series.*

Moore's Orthopedic Surgery

A Manual of Orthopedic Surgery. By JAMES E. MOORE, M.D., Professor of Clinical Surgery, University of Minnesota, College of Medicine and Surgery. Octavo of 356 pages, handsomely illustrated. Cloth, $2.50 net.

"The book is eminently practical. It is a safe guide in the understanding and treatment of orthopedic cases. Should be owned by every surgeon and practitioner."—*Annals of Surgery.*

Fowler's Operating Room

New (3d) Edition, Reset

The Operating Room and the Patient. By RUSSELL S. FOWLER, M. D., Surgeon to the German Hospital, Brooklyn, New York. Octavo of 611 pages, illustrated. Cloth, $3.50 net.

Dr. Fowler has written his book for surgeons, nurses assisting at an operation, internes, and all others whose duties bring them into the operating room. It contains explicit directions for the preparation of material, instruments needed, position of patient, etc., all beautifully illustrated.

Nancrede's Principles of Surgery

New (2d) Edition

Lectures on the Principles of Surgery. By CHAS. B. NANCREDE, M.D., LL.D., Professor of Surgery and of Clinical Surgery, University of Michigan, Ann Arbor. Octavo, 407 pages, illustrated. Cloth, $2.50 net.

"We can strongly recommend this book to all students and those who would see something of the scientific foundation upon which the art of surgery is built."—*Quarterly Medical Journal, Sheffield, England.*

Nancrede's Essentials of Anatomy.

Seventh Edition

Essentials of Anatomy, including the Anatomy of the Viscera. By CHAS. B. NANCREDE, M.D., Professor of Surgery and of Clinical Surgery, University of Michigan, Ann Arbor. Crown octavo, 388 pages; 180 cuts. With an Appendix containing over 60 illustrations of the osteology of the body. Based on *Gray's Anatomy.* Cloth, $1.00 net. *In Saunders' Question Compends.*

"The questions have been wisely selected, and the answers accurately and concisely given."—*University Medical Magazine.*

Martin's Essentials of Surgery.

Seventh Edition Revised

Essentials of Surgery. Containing also Venereal Diseases, Surgical Landmarks, Minor and Operative Surgery, and a complete description, with illustrations, of the Handkerchief and Roller Bandages. By EDWARD MARTIN, A.M., M.D., Professor of Clinical Surgery, University of Pennsylvania, etc. Crown octavo, 338 pages, illustrated. With an Appendix on Antiseptic Surgery, etc. Cloth, $1.00 net. *In Saunders' Question Compends.*

"Written to assist the student, it will be of undoubted value to the practitioner, containing as it does the essence of surgical work."—*Boston Medical and Surgical Journal.*

Martin's Essentials of Minor Surgery, Bandaging, and Venereal Diseases.

Second Revised Edition

Essentials of Minor Surgery, Bandaging, and Venereal Diseases. By EDWARD MARTIN, A.M., M.D., Professor of Clinical Surgery, University of Pennsylvania, etc. Crown octavo, 166 pages, with 78 illustrations. Cloth, $1.00 net. *In Saunders' Question Compends.*

"The best condensation of the subjects of which it treats yet placed before the profession."—*The Medical News, Philadelphia.*

26.A.207.
The practice of pediatrics 1914
Countway Library AGY5243
3 2044 045 076 536

26.A.207.
The practice of pediatrics 1914
Countway Library AGY5243
3 2044 045 076 536